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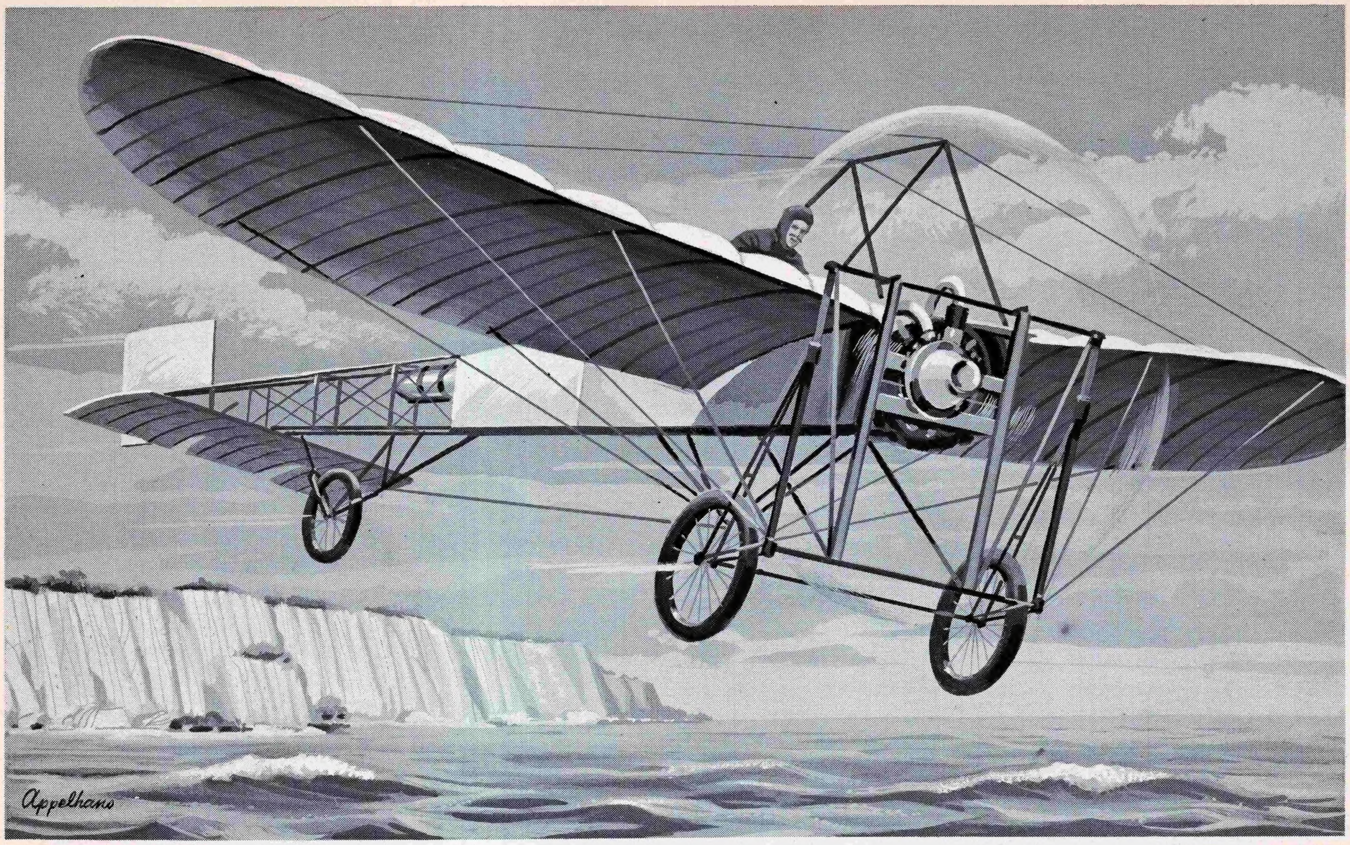

Louis Bleriot flies the English Channel

On July 25, 1909, bold headlines announced Bleriot's remarkable feat of being the first to fly from Baraques, France to Dover, England over the English Channel. His monoplane was of his own design and construction. Noted for its unusual simplicity and efficiency his plane made the famous flight in 37 minutes time. As the first flier to make the crossing by air he qualified for a prize of £1,000 offered by the London Daily Mail . . . another milestone in Aviation was passed.

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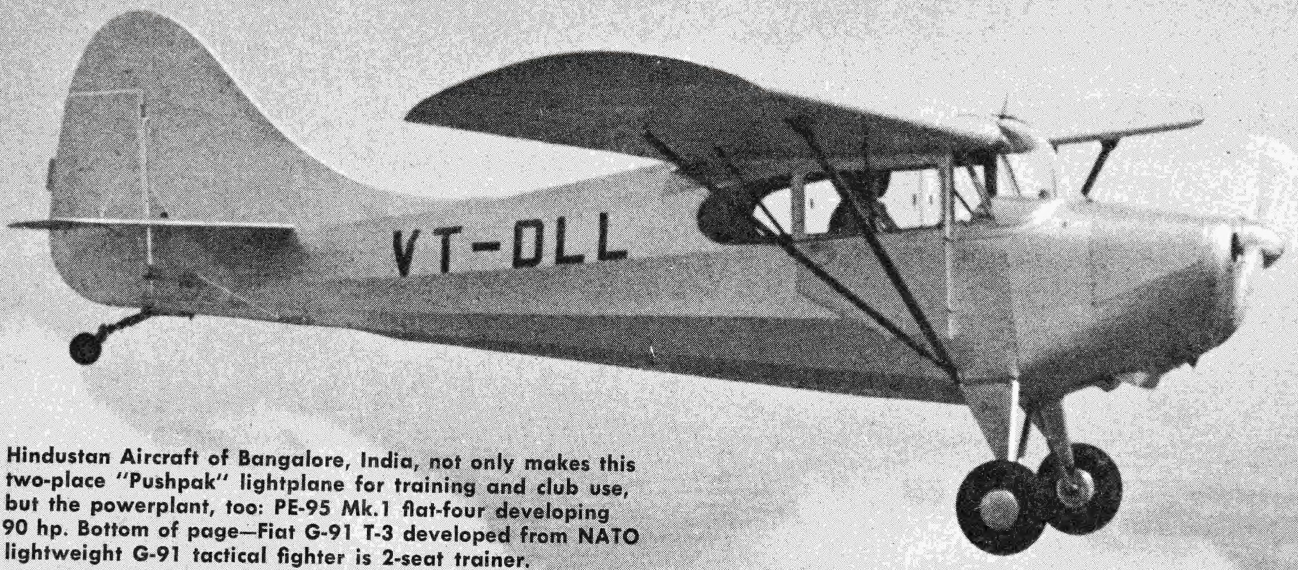

Hindustan Aircraft of Bangalore, India, not only makes this two-place "Pushpak" lightplane for training and club use, but the powerplant, too: PE-95 Mk.1 flat-four developing 90 hp. Bottom of page—Fiat G-91 T-3 developed from NATO lightweight G-91 tactical fighter is 2-seat trainer.

Air Progress

HISTORY OF AVIATION
WINTER 1960 EDITION

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CONTENTS

Pictorial Air Review 4
Accident Report by Frederic Howard 12
Albatros Triplane Three View by Walt Musciano 18
The Plane That Sold Air Travel by Douglas Ingells 19
Continental A-65-8 by James Triggs 25
Russian Bombers by Major George Geiger 26
Forgotten Fighters by Peter Bowers 34
The Cessna Story 46
Curtiss HS-1 Flying Boat by Peter Bowers 67
English Electric "Wren" by Douglas Rolfe 72
Marking Errors by Peter Bowers 74
Dyna Soar 77
Japanese Aircraft Markings by Richard Bueschel 78
Bookshelf Department 90

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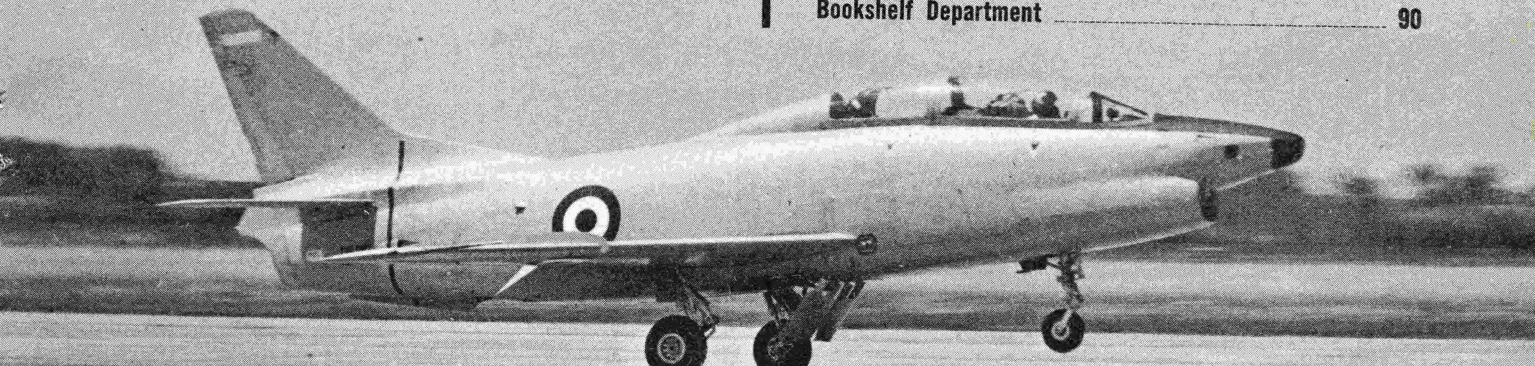

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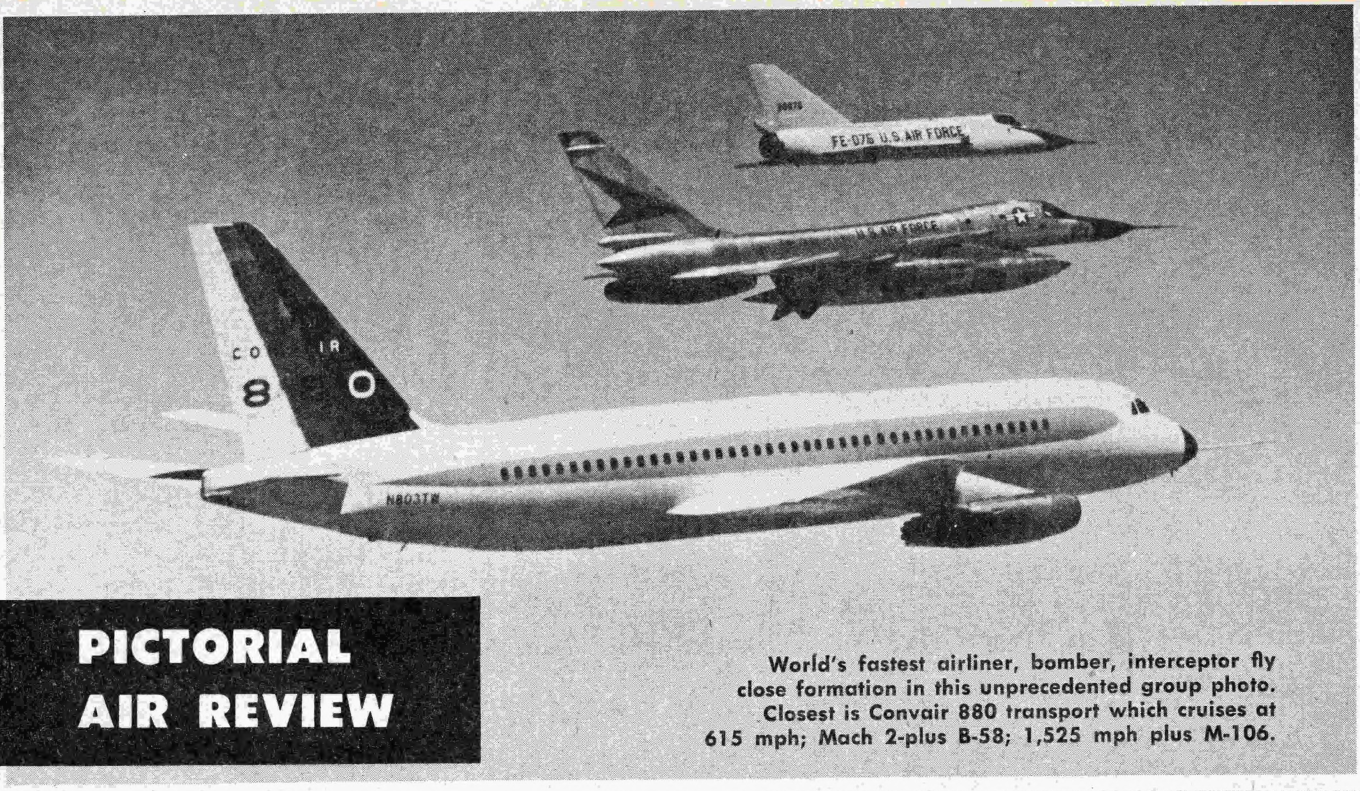
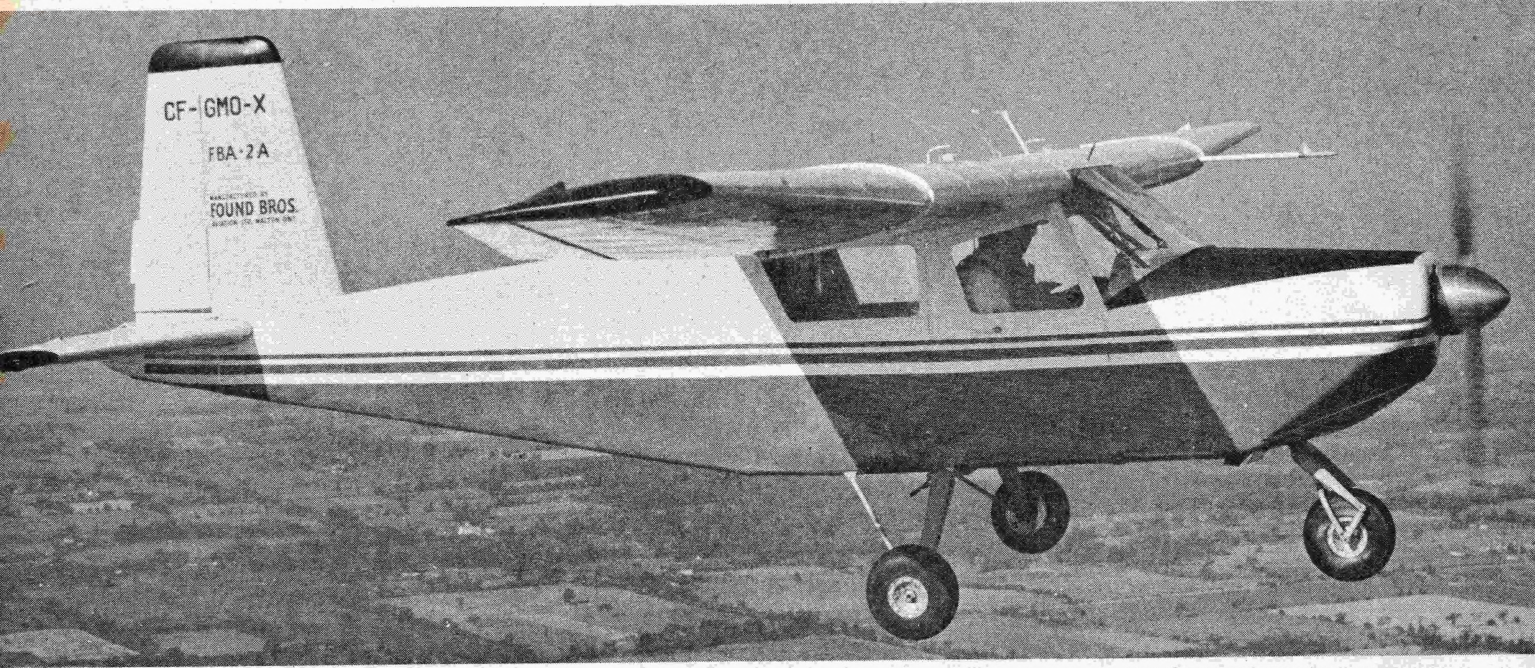
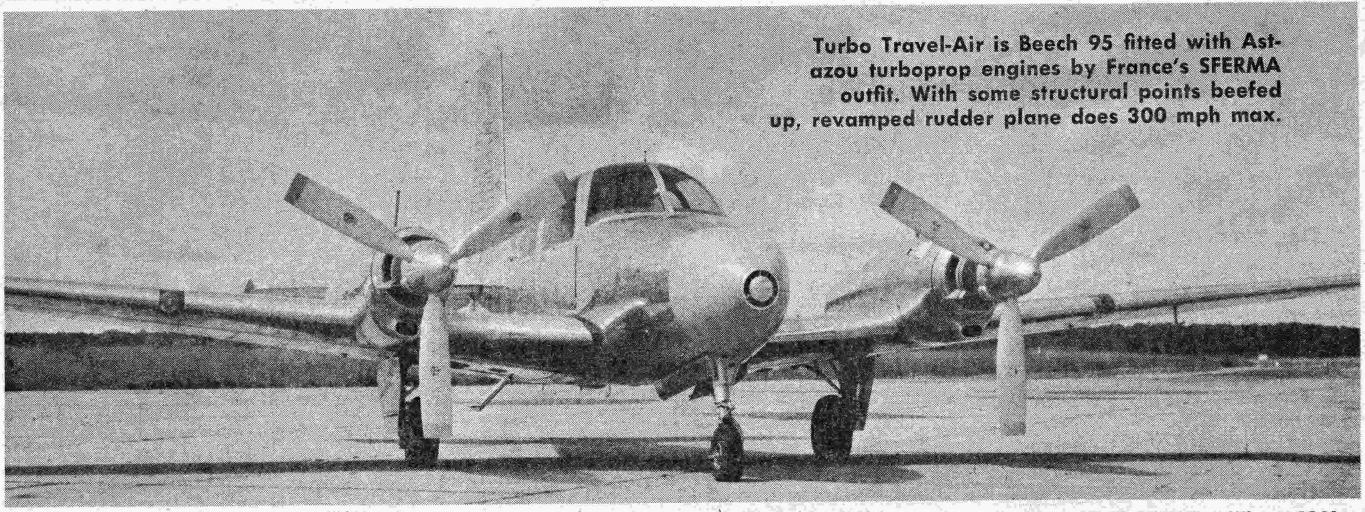
PICTORIAL AIR REVIEW

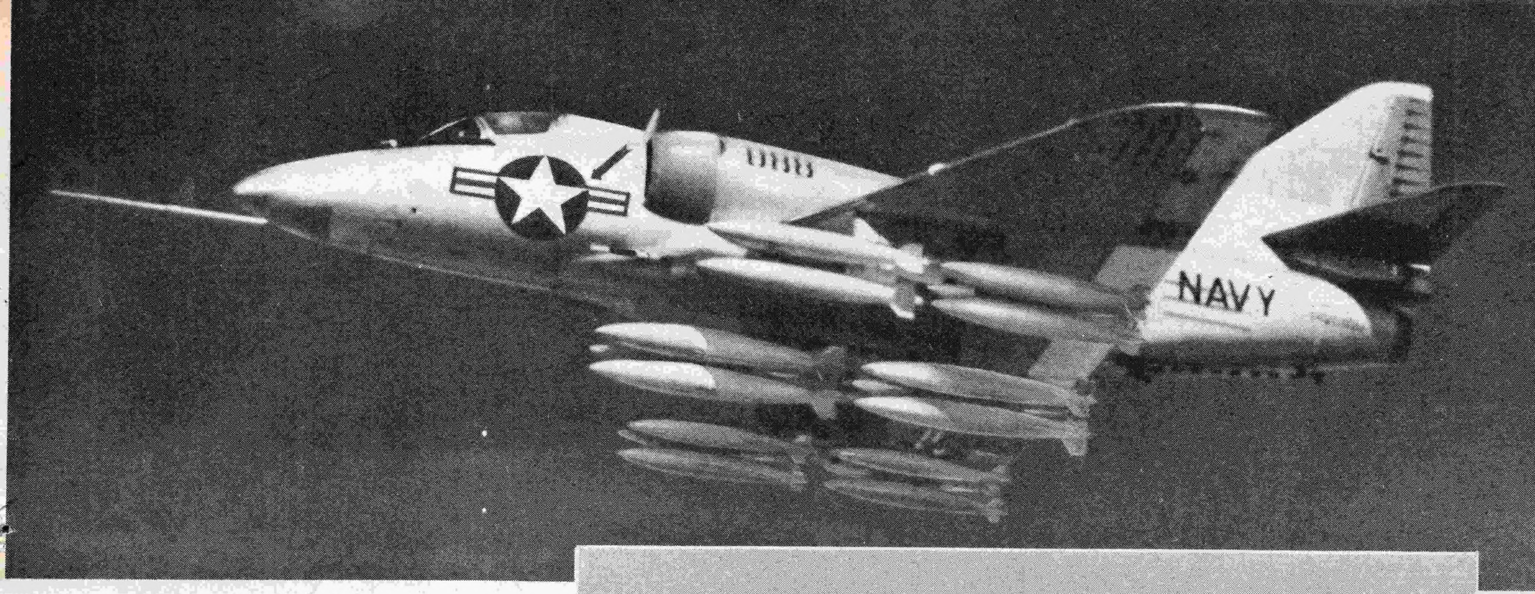


World's fastest airliner, bomber, interceptor fly close formation in this unprecedented group photo. Closest is Convair 880 transport which cruises at 615 mph; Mach 2-plus B-58; 1,525 mph plus M-106.

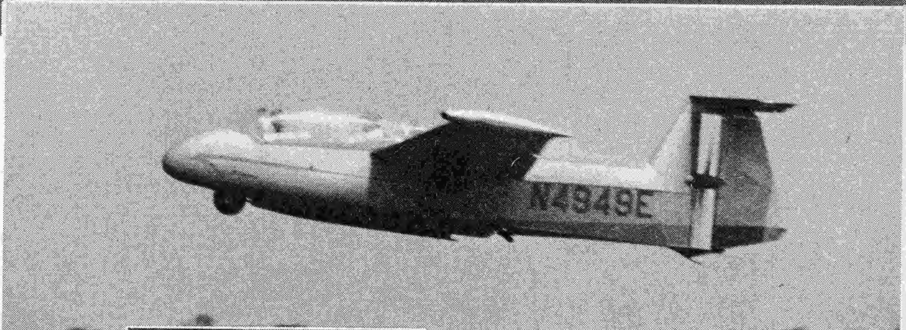




Turbo Travel-Air is Beech 95 fitted with Astazou turboprop engines by France's SFERMA outfit. With some structural points beefed up, revamped rudder plane does 300 mph max.

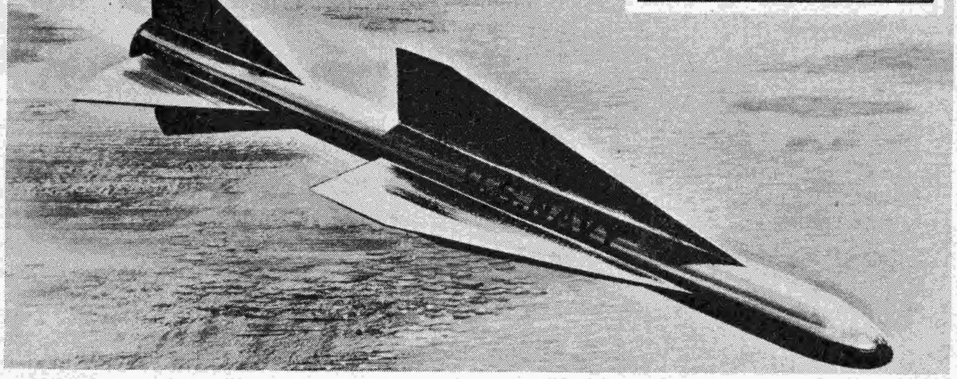


King-size striking power for Navy's midget Douglas A4D Skyhawk available via multiple bomb rack adapter. Will become operational on USN's fleet of nuclear weapons toting Skyhawks.



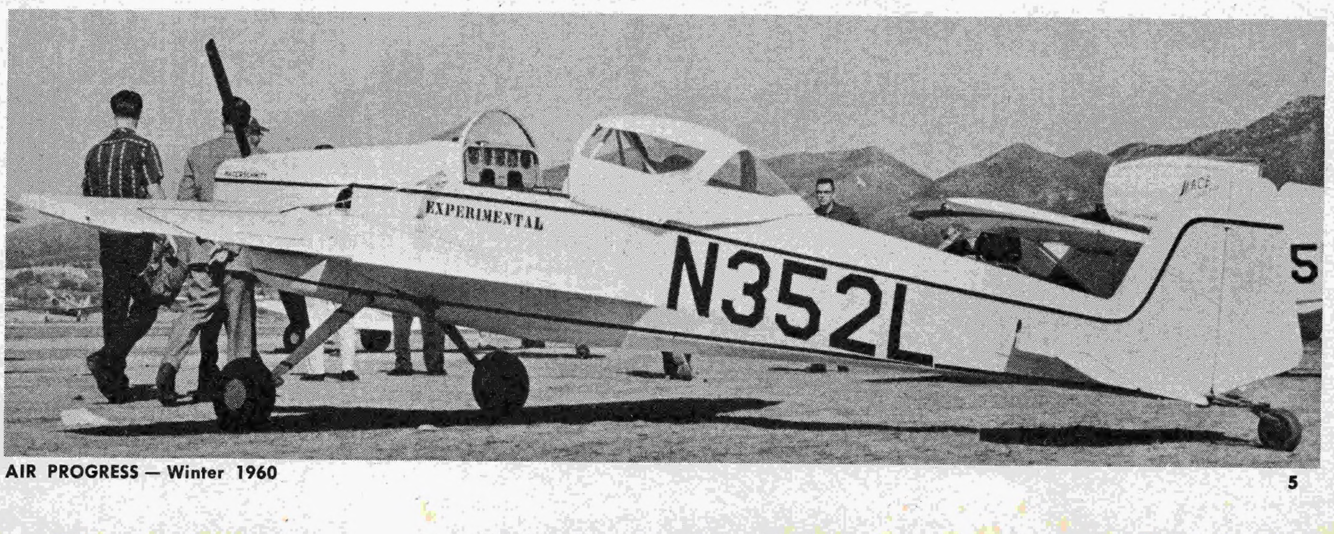
LEFT, CENTER: Found Brother' all-metal 4-place bush plane, FBA-2A, uses 250 hp Lycoming power. Canadian craft spans 36 feet, length 24.3 feet, 180 square foot wing area.

Rhein RW-3 "Multoplane" (above) is now flying in U.S. Two-blade prop mounted in slot between fin and rudder is driven by 95 hp Continental. German craft can be ordered as 34′ 2″ span sportplane or 50½′ span power-assist sailplane.



Artist's conception of Navy's Eagle missile (left) for air-to-air long range defense. This is part of USN "Missileer" program. Douglas is producing plane, Bendix and Grumman the missile.

Harvey Mace's "Macerschmitt" is husky home-built from Sacramento, Calif. Climbs 2000′/min. on 125 hp Lycoming. Taperwing spans 16½′, length 17′ 9″, empty weight, 685 lbs. Top speed 170 mph.



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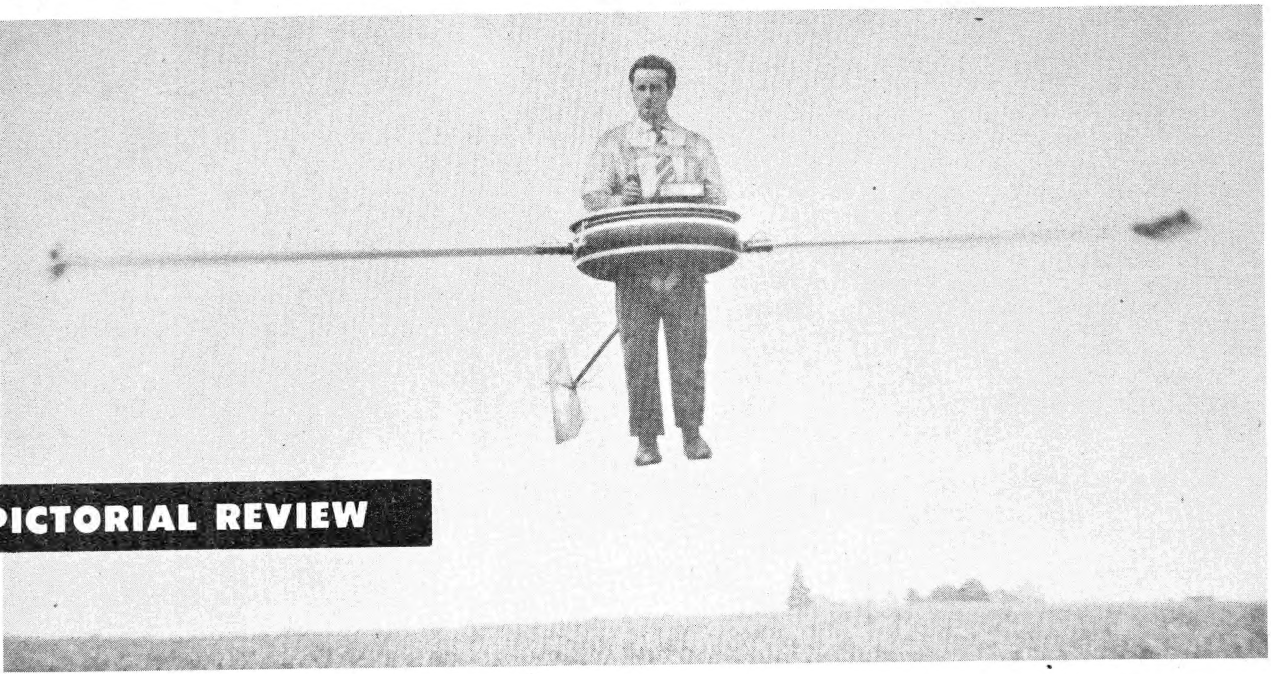
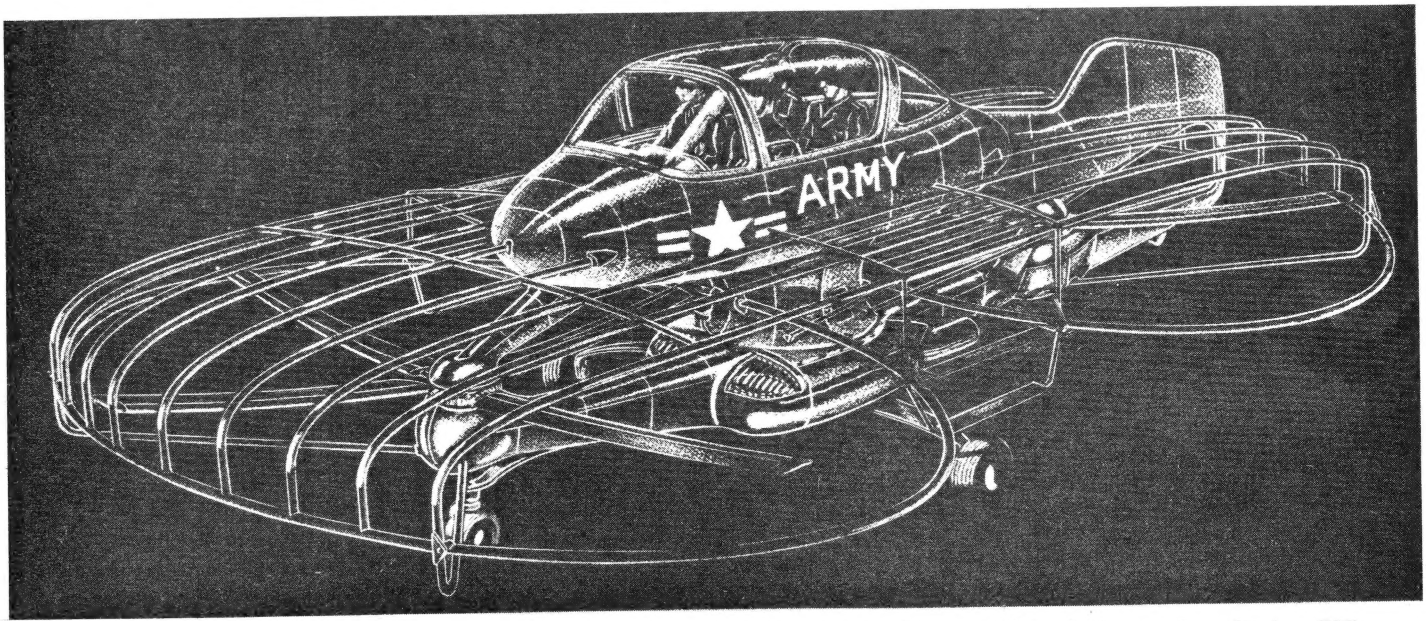


Swiss flying belt design (above) revived in Canada by Arnold Junker of Quebec. Rotor diameter 16', weight 105 lbs. Original pulse jet tip units were Japanese. First model destroyed in crash, pilot not seriously hurt.

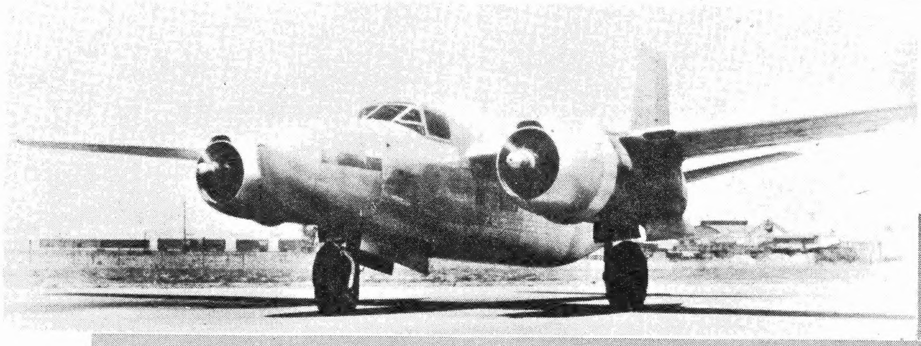
Gyrodyne's latest ground effects machine (GEM) at right. This earth-hugging saucer uses Porsche powerplant. Round-up of GEM craft appeared in Spring 1960 edition of "Air Progress" on pages 32, 33, and 34.



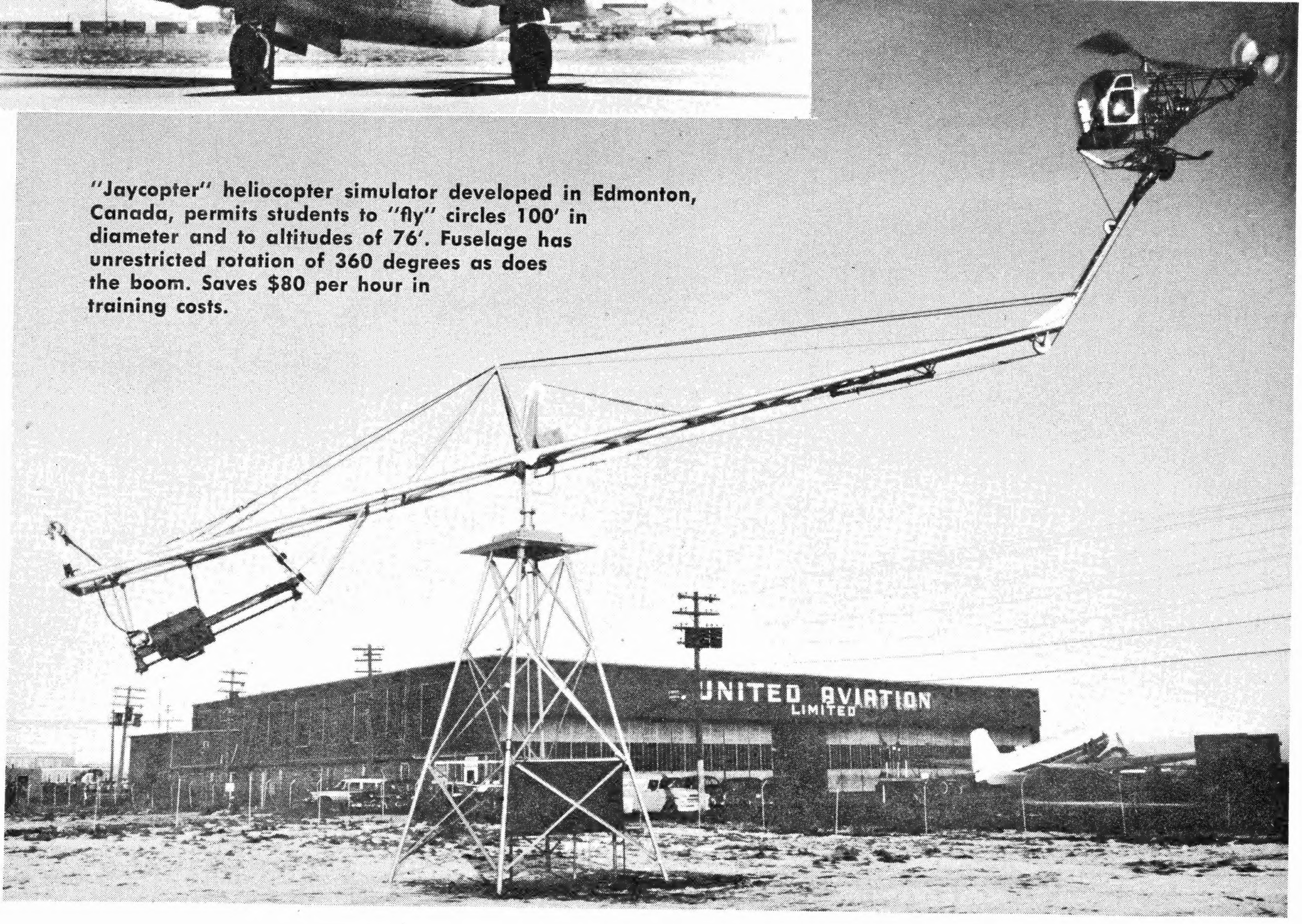
Kellett Aircraft's new type aerial jeep (above) for Army eliminates fore and aft ducts, uses guard rings instead to overcome pitching tendencies at foward speeds which came from asymmetrical flow of air over ducts.

With Pratt & Whitney JT3D turbofan engines Boeing 707-120B makes maiden flight (below). Maximum cruising speed raised to 610 mph. Large fan at engine's front, pushes air past as well as through it.

Douglas A-26B bomber convered into luxurious, high-speed transport (left) by Rhodes Berry Co. Called "Silver Sixty," seats 14 passengers plus crew of 2. Stand-up head-room achieved by adding deeper lower-half fuselage. Does 300 mph plus with Pratt & Whitney R-2800's.



"Jaycopter" heliocopter simulator developed in Edmonton, Canada, permits students to "fly" circles 100' in diameter and to altitudes of 76'. Fuselage has unrestricted rotation of 360 degrees as does the boom. Saves $80 per hour in training costs.



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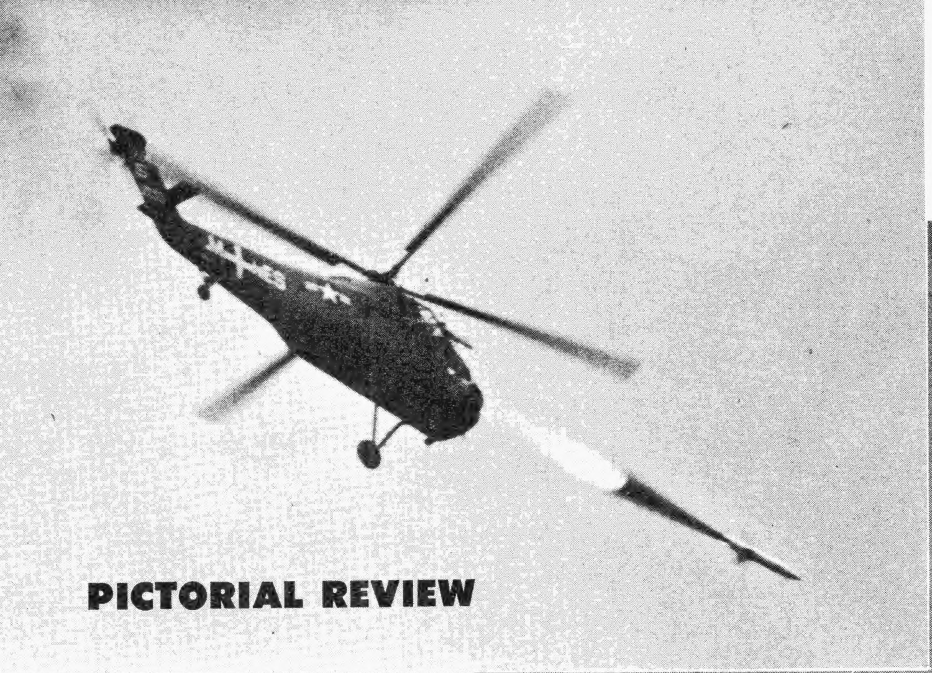
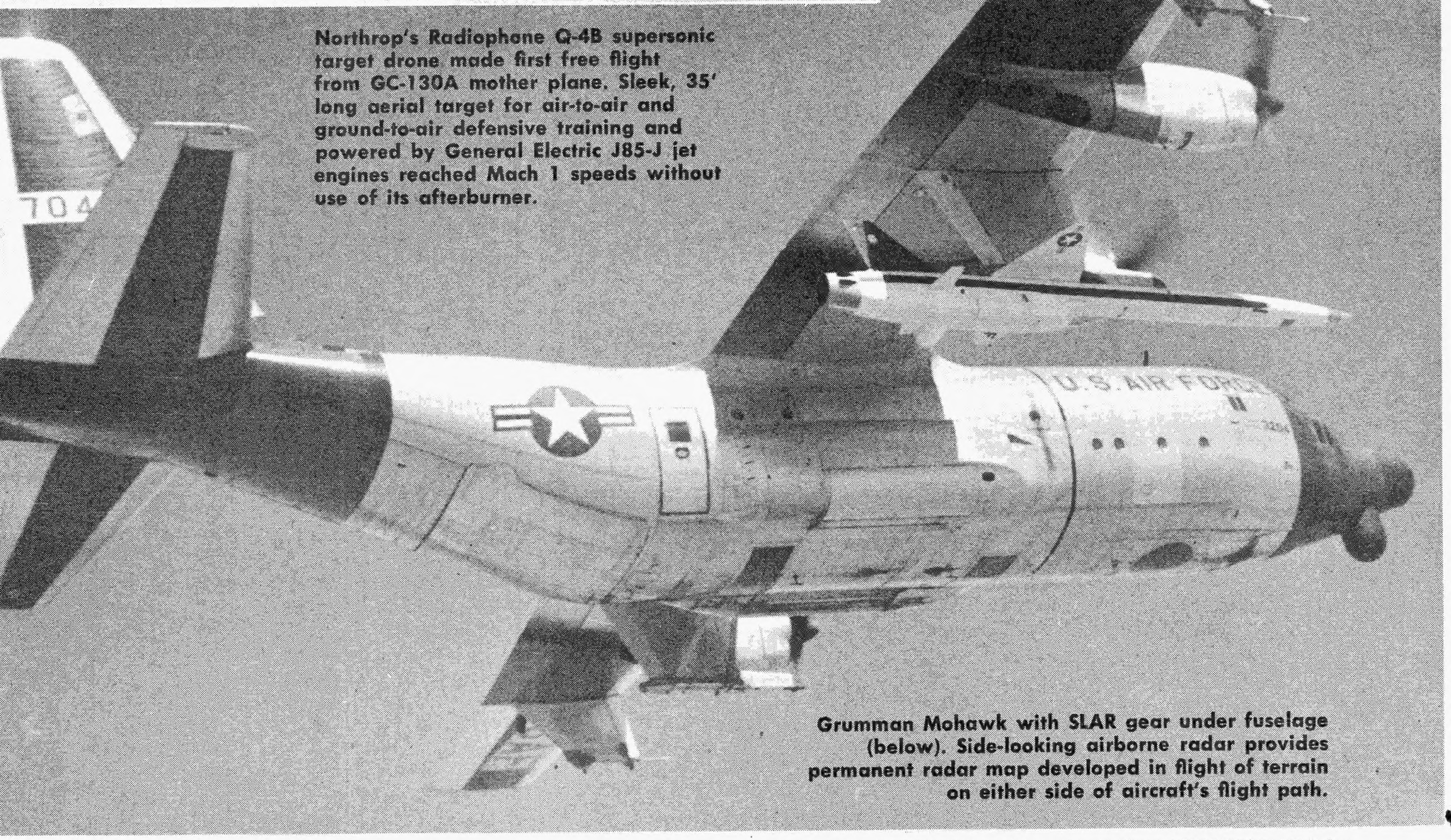
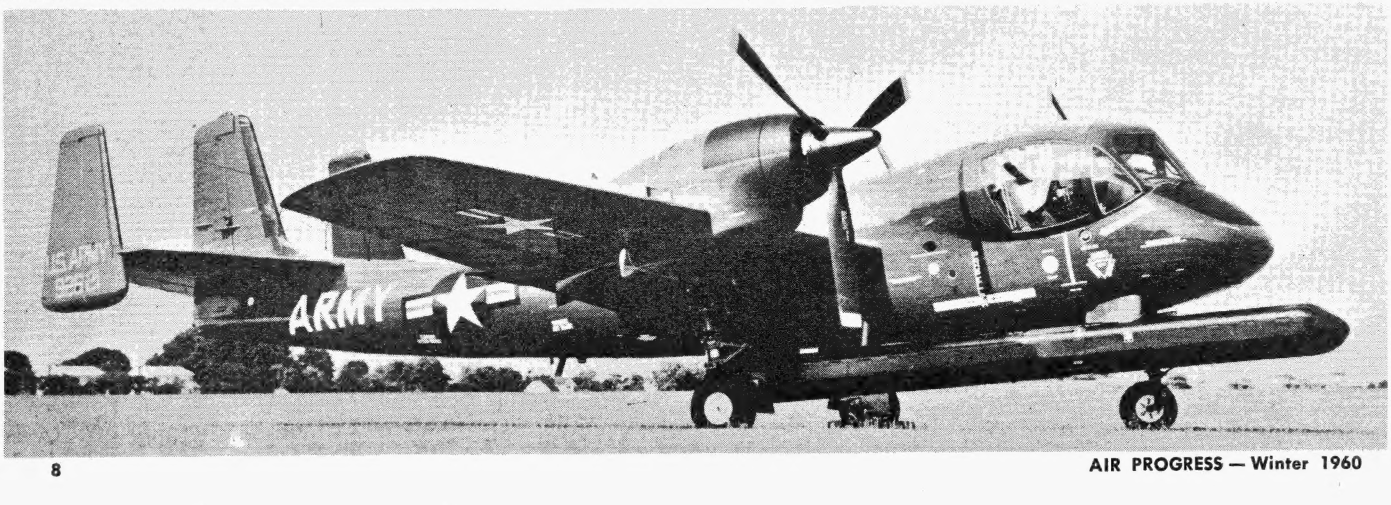


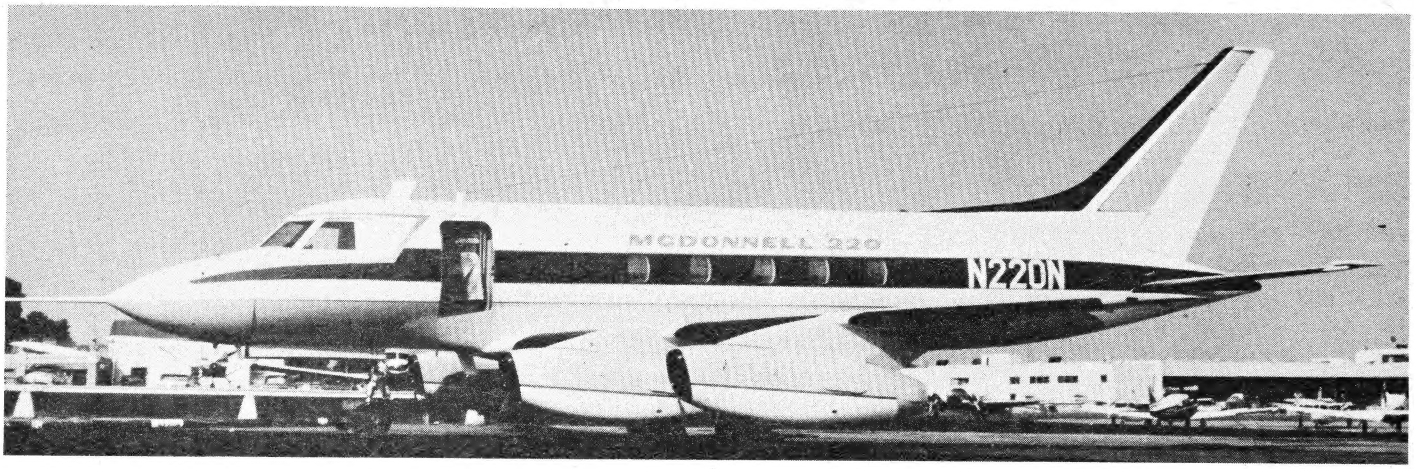
Marine Corps Sikorsky HUS-1 copter (left) fires 12½', 570 pound Navy Martin Bullpup. Once launched, pilot guides radio controlled missile to target by switch on his control stick. Flares in aft section help pilot keep it in sight.



Northrop's Radiophone Q-4B supersonic target drone made first free flight from GC-130A mother plane. Sleek, 35' long aerial target for air-to-air and ground-to-air defensive training and powered by General Electric J85-J jet engines reached Mach 1 speeds without use of its afterburner.

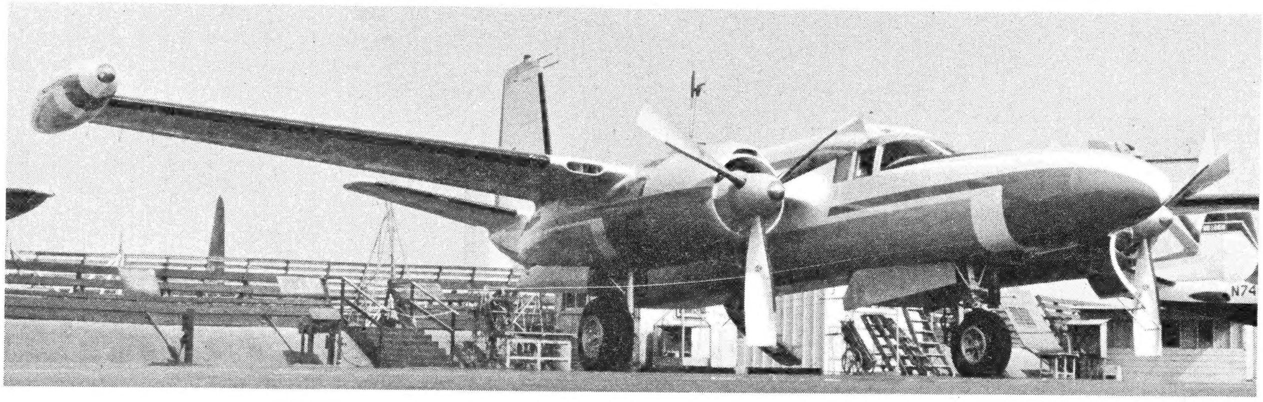
Grumman Mohawk with SLAR gear under fuselage (below). Side-looking airborne radar provides permanent radar map developed in flight of terrain on either side of aircraft's flight path.

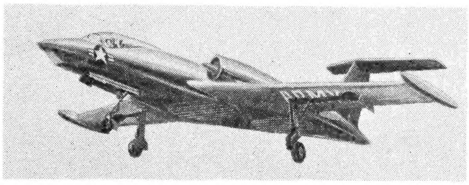


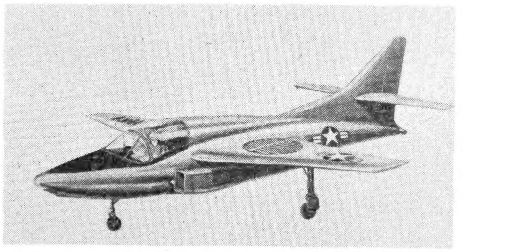


McDonnell Aircraft revamped its USAF competition light jet transport into business offering above. Model 220 using 4 Westinghouse J-34 turbojets can carry 10 passengers at 570 mph top speed, to 40,000 feet, over 2,100 mile range. New light aft-fan CF-700's by G.E. may be installed.

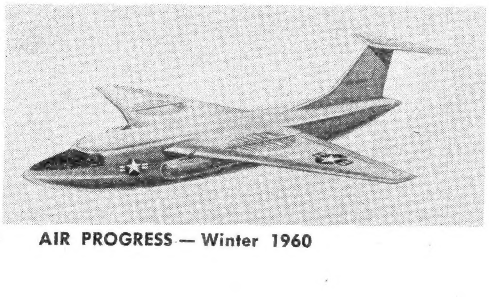
L. B. Smith's "Tempo II" is another reworked Douglas A-26 with pressurized, air-conditioned cabin. Stand-erect, walk-through 28' interior; 10 passengers. 2000-2500 hp P&W R-2800's, cruises 350 mph, top above 400. Range 2400 mi.; ceiling 29,600; $440,000.

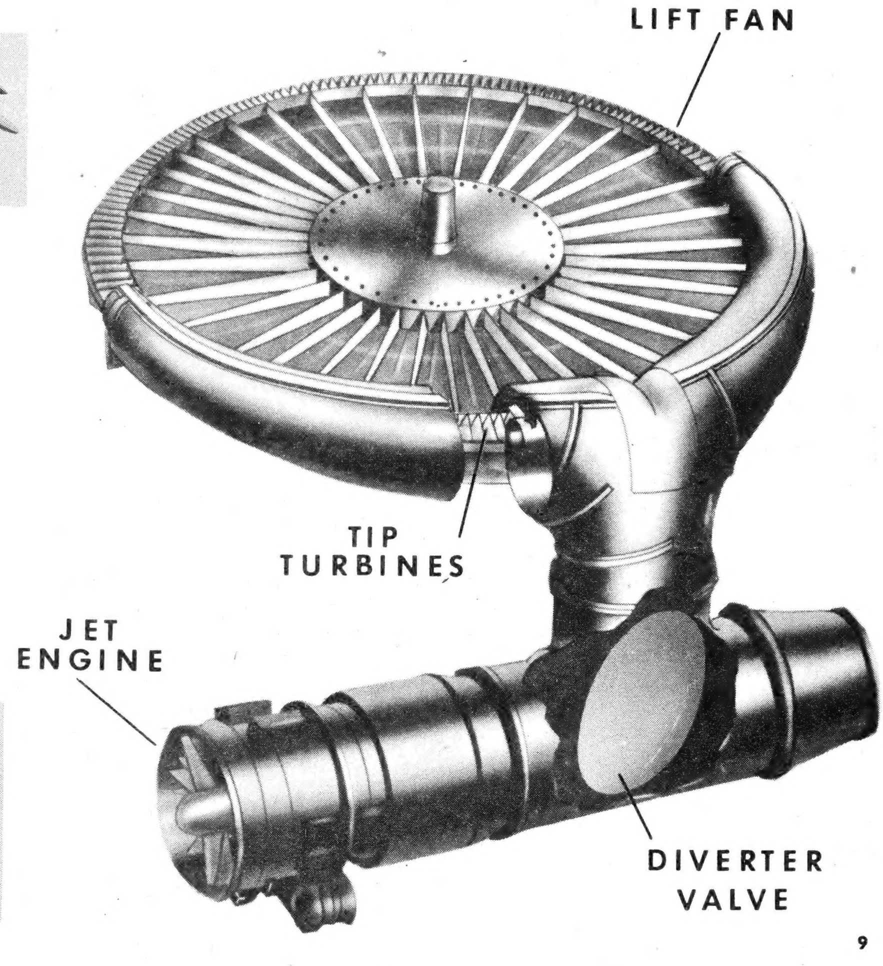


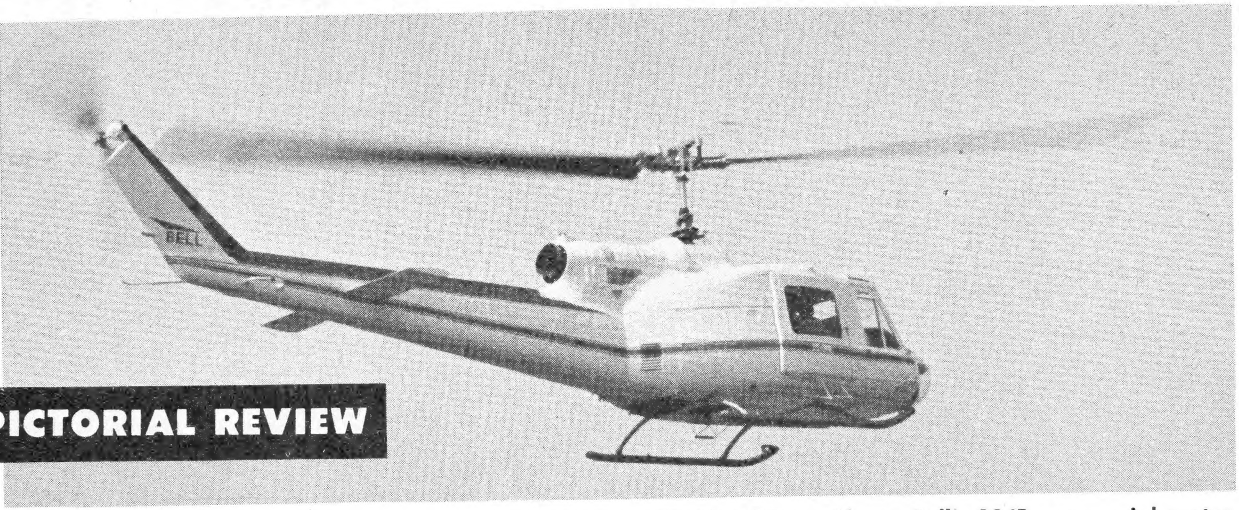




"Lift fan" propulsion system by G.E. multiplies thrust of conventional turbojet for vertical lift. Using lift fan, 2500-lb thrust J-85 develops 7500-lb lift for vertical flight. VTOL possibilities with power plant from top: observation, front line photo-recon job, transport.







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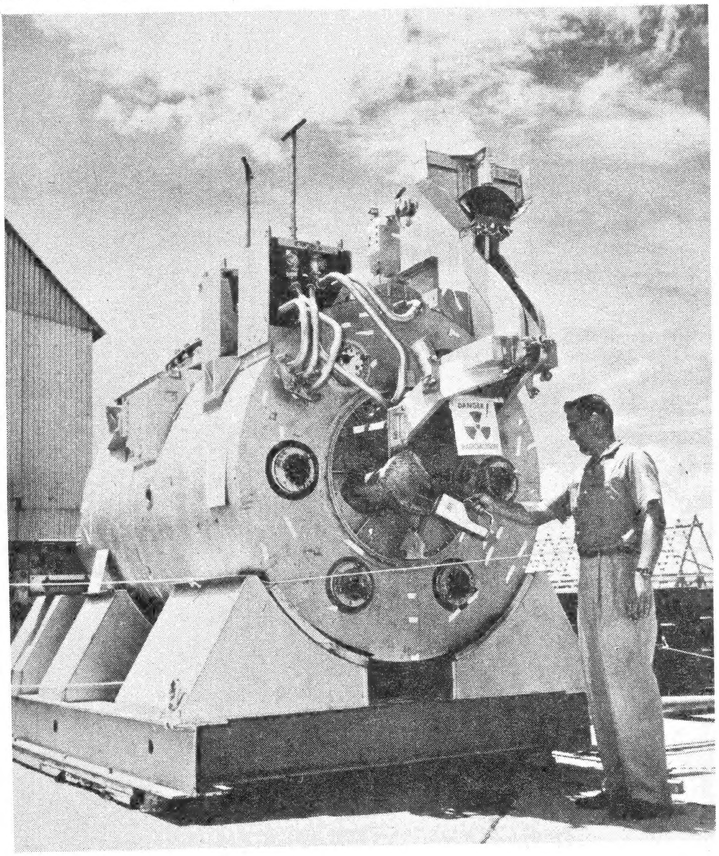


Above: Bell's 204B commercial copter carries 10 at 147 mph top, 260 miles. Military counterpart Army's HU-1 Iroquois set world records for speed, distance, and climb.

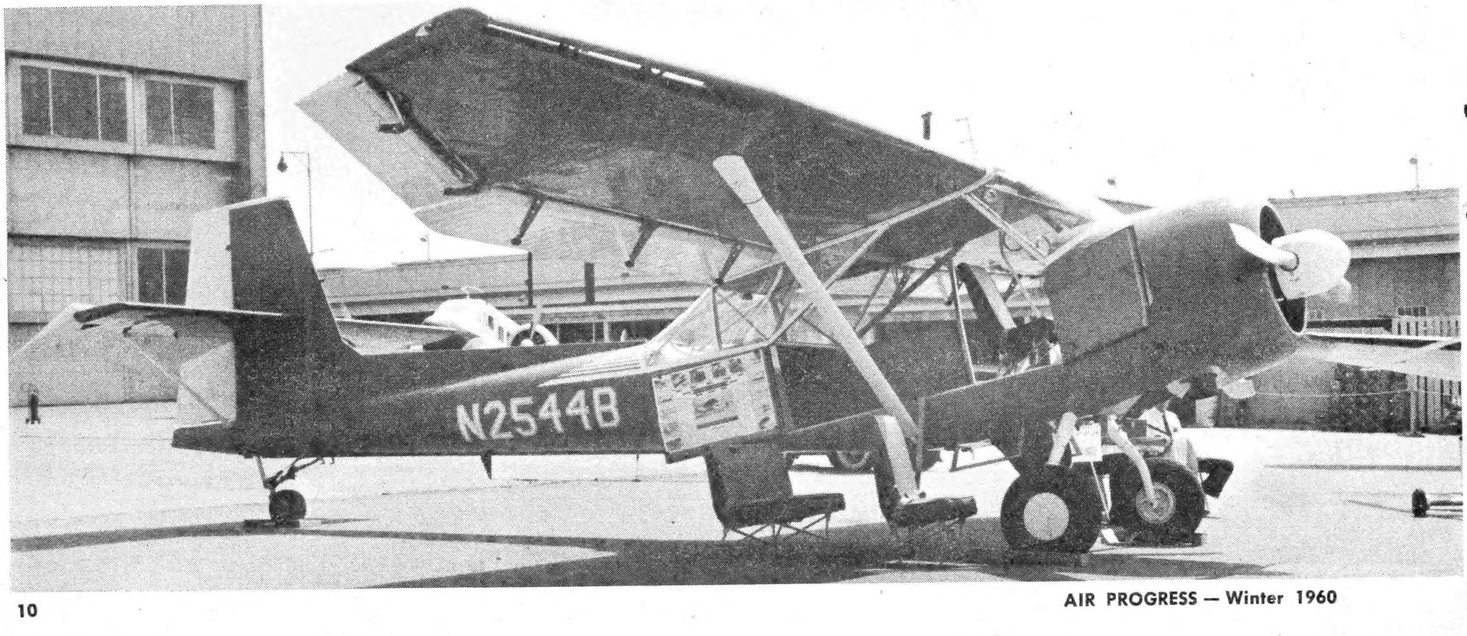
Opposite top: Navy's DASH (destroyer anti-sub helicopter) concept gets boost from success of Kaman HTK radio controlled, pilotless copters. Torpedo carrying proposal shown.

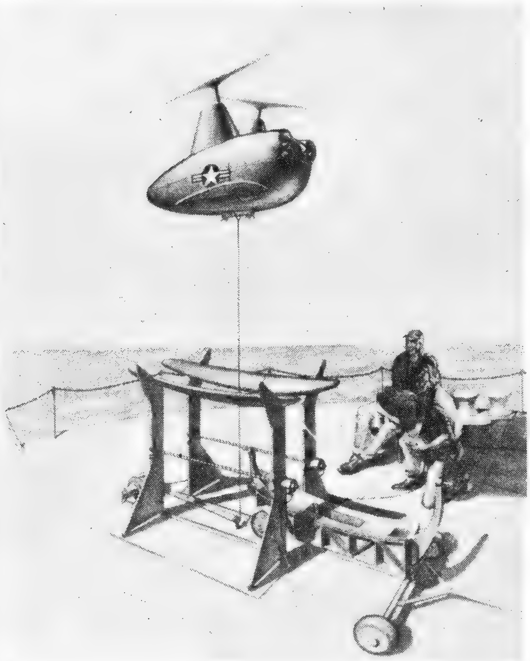
Left: First nuclear reactor carried aloft goes into retirement. Flown in modified B-36 to gather data on radiation and shielding; made 47 flights, first in 1955.

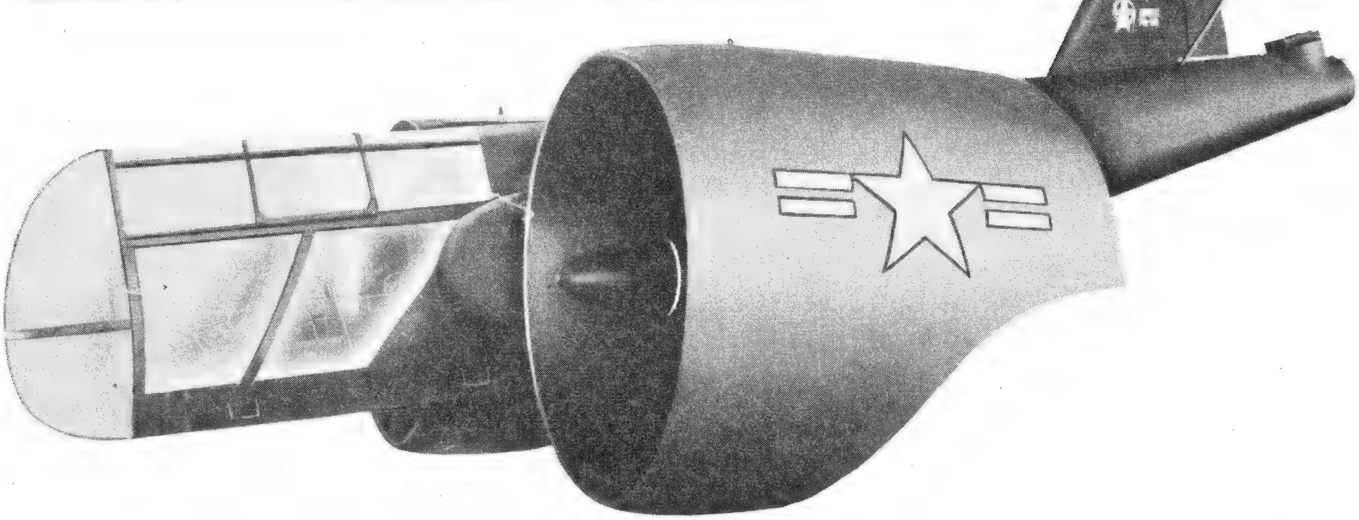
Opposite center: Piasecki Aircraft's mock-up of "Ring-Wing" VTOL/STOL craft. Annular wings serve as shrouds for props. Gases from turbine power exhaust through tail nozzles.

Opposite bottom: Britten-Normen Cushion-craft for travel over jungle roads, across rivers transporting bananas. Annular fan driven by sports car engine and wheel.

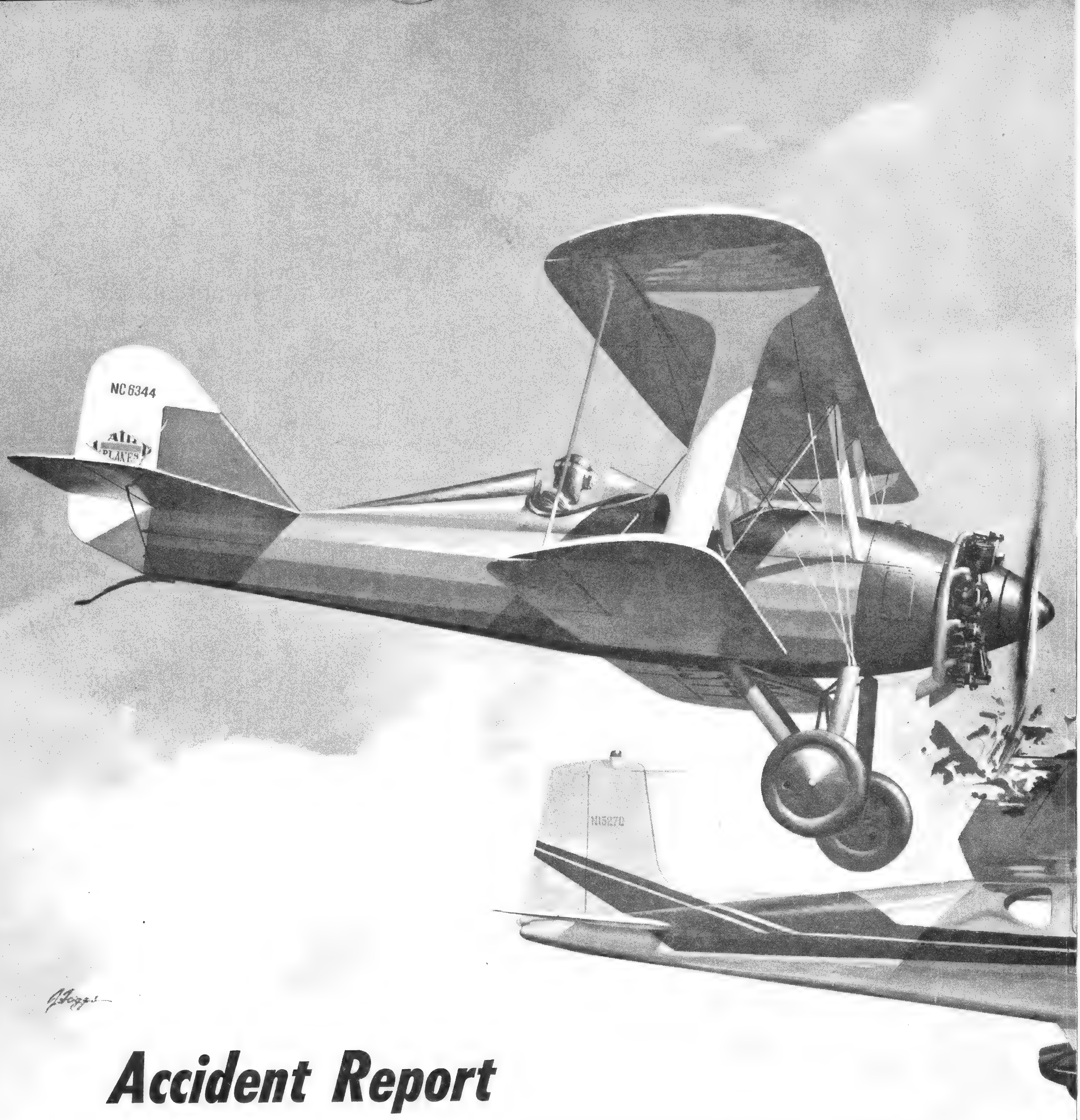
Below: CV-105 "Loadmaster" is Servicair's conversion of surplus Convair L-13. Power 450 hp P&W Wasp. Totes 1400-lb payload 600 miles, cruises 130 mph at 9000'.







CUSHIONCRAFT



Accident Report

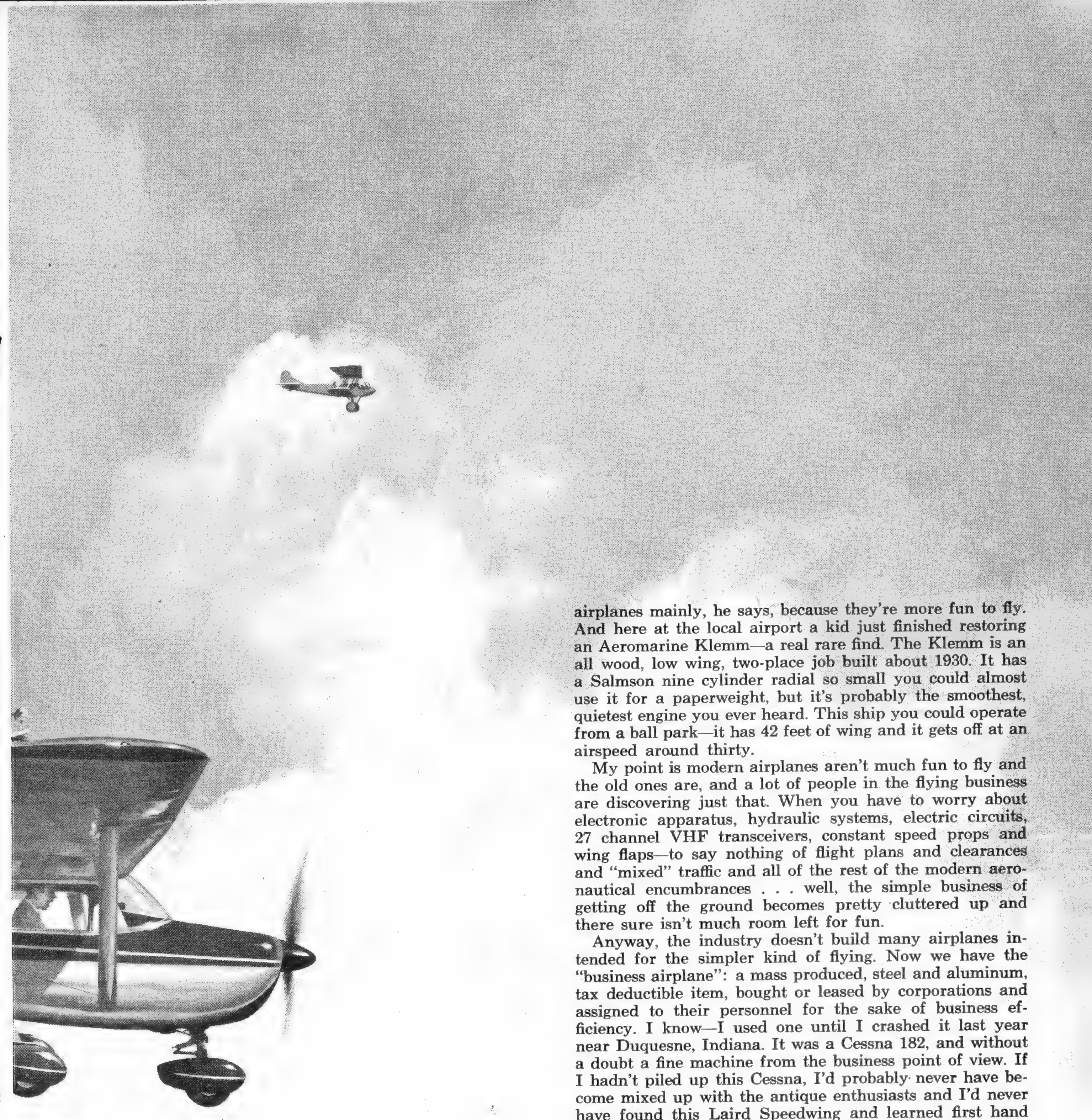
How could Fred bust into the landing circuit at the 1934 Indiana Air Tour stop in a "182"? Anyway, he finally traced down that Speedwing!

Reported by Frederic K. Howard

Illustrated by James M. Triggs

■ Maybe you've heard something about this antique airplane mania that has spread across the country? It's had plenty of publicity and if you live anywhere near Oskaloosa, Iowa or Merced, California or Stormville, New York the chances are you're aware of it. The annual migrations, called "fly-ins," of restored old airplanes to those towns has attracted a lot of attention. The local newspapers, and the city press too, have played it up big with stories and pictures of the biplanes of a generation or so ago. The public has flocked out to the fields to discover that old airplanes have much the same sort of nostalgic appeal as old cars. Maybe everyone likes to live a little in yesterday, so to speak. Could be. Otherwise why do we look at those old depression movies on TV, and buy the re-issues on long-play records of songs like *Night and Day*, *Blue Skies*, *Star Dust*, or *Melancholy Baby*?

Although I'm only a recent convert, I've known about these airplane "antiquers" for a long time—I guess for as long as there's been any restoring of old airplanes going on.



I'm not talking about the fragile museum pieces—the early Curtiss pushers or the Bleriots or the Farmans.

The sort of airplanes I mean were built between 1920 and 1934—the period the "antiquers" call the "Golden Age." And when these wood and fabric ships are restored properly, the Government will re-license them. They're flown just for the fun of flying. Take for example this airline captain I know who pushes DC-6's up and down the west coast. He ran across a Stearman C-3 stored in an old Long Beach warehouse and restored it last year. The Stearman is an open three-place biplane built in 1927 and this airline captain swears it's a better airplane than any modern ship. He means it, too. Or take the crop duster type I met a couple of years ago who operates down in the Ozarks and who has rebuilt a whole hangar full of 1927-32 airplanes mainly, he says, because they're more fun to fly. And here at the local airport a kid just finished restoring an Aeromarine Klemm—a real rare find. The Klemm is an all wood, low wing, two-place job built about 1930. It has a Salmson nine cylinder radial so small you could almost use it for a paperweight, but it's probably the smoothest, quietest engine you ever heard. This ship you could operate from a ball park—it has 42 feet of wing and it gets off at an airspeed around thirty.

My point is modern airplanes aren't much fun to fly and the old ones are, and a lot of people in the flying business are discovering just that. When you have to worry about electronic apparatus, hydraulic systems, electric circuits, 27 channel VHF transceivers, constant speed props and wing flaps—to say nothing of flight plans and clearances and "mixed" traffic and all of the rest of the modern aeronautical encumbrances . . . well, the simple business of getting off the ground becomes pretty cluttered up and there sure isn't much room left for fun.

Anyway, the industry doesn't build many airplanes intended for the simpler kind of flying. Now we have the "business airplane": a mass produced, steel and aluminum, tax deductible item, bought or leased by corporations and assigned to their personnel for the sake of business efficiency. I know—I used one until I crashed it last year near Duquesne, Indiana. It was a Cessna 182, and without a doubt a fine machine from the business point of view. If I hadn't piled up this Cessna, I'd probably never have become mixed up with the antique enthusiasts and I'd never have found this Laird Speedwing and learned first hand how much more feeling you can have for the old biplanes with their spruce and dural and fabric than for these standardized, impersonal, efficient modern aircraft.

I suspect my family and my business associates think I'm still suffering some kind of shock from that crash when I start talking about my Laird. I suppose I do sound cracked when I get on the subject. But unless you happen to have a weakness for the old airplanes you just can't understand about this Laird. I could talk at you forever and you still wouldn't get it. So I'll only mention the facts and maybe from them you can get some idea of what it's all about.

This airplane is the original LC-R200 Speedwing (the first of 43 airplanes eventually built to this design) manufactured in June of 1927 at Ashburn Field on 83rd Street in Chicago by Mattie Laird. It's a three-place, open-cockpit biplane with the short twenty-eight foot wings and was considered in its time quite a "hot" airplane. Some of the airlines—I believe Northwest and Western Canada—used this Speedwing design for their mail runs about 1930 and broke quite a few point-to-point records. The Laird company, like so many, didn't make it through the depression and Ashburn Field became a Chicago real-estate development around 1940.

The Federal Aviation Agency—the government outfit that controls all civilian aviation—tells me that mine is one of the few Lairds left. And it's a true classic. A Laird Speedwing is to the antique airplane collector what a Dusenberg Model SJ would be to the classic car fan—maybe even more so. You see, Mattie Laird didn't make any aeronautical junk. At a time when everybody was trying to get into the act—there were almost as many airplane companies as airplanes after the Lindbergh flight—Lairds were known as the "Thoroughbreds of the Airways" and each ship was to some extent custom made with price no great concern. One trick the Laird company had, I've been told, was to use a couple of coats of spar varnish over the doped fabric. This made for the most beautiful finish any airplane ever had . . . but mechanics sure used to cuss it later on because they couldn't patch the fabric without a lot of extra work.

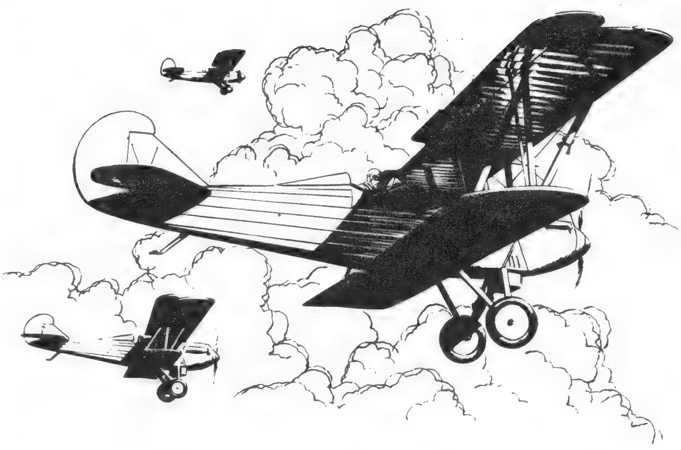
I haven't said much about how I happened to track down this Laird. Until now I've only said that I ran across it in the loft of an old hangar on what had once been an airport near Eola, Iowa. When I found it early this year the hangar was a rotted, sagging shed housing mostly rusting farm implements and the airport had been flooded out three different times by the Iowa River. What had been the airport was a corn field owned by the local farmer who took it over from the town of Eola after it was abandoned as an airport in 1938. Stuffed in the rafters of this dilapidated hangar I found the dismantled, damaged, but complete remains of my Wright J-4 powered Laird Speedwing. I paid $100 for it and $150 more to have it trucked down to my home near St. Louis.

Now all of that is true but it isn't the whole story. Actually, I set out last October to find, not just any antique aircraft, but this particular Laird Speedwing—or its remains—because this airplane alone could prove what really happened over Duquesne, Indiana, last August 10th right before I crashed my Cessna there. I spent a lot of time from last October to January of this year running down leads on this airplane. The FAA wasn't much help although you would think the government could come up with at least some information useful in this kind of search. But before I get into that, I want to explain about the air collision near Duquesne.

The FAA of course collected all the facts last August but, until I located this Laird over in Iowa, they had quite a different idea about it than I had. Well, I don't think they do any longer and that is why they are re-opening the investigation. So here is exactly the way it all came about:

On the 10th of August last year I was nearing Duquesne at around 3,000 feet in the Cessna flying VFR from St. Louis to Cincinnati. The weather had been spotty—I'd been dodging local thunderstorms for quite a time and it was rougher than a cob. I had crossed the Wabash farther north than I expected to—some thirty miles north of Vincennes—and I had decided to land at Duquesne airport and sit it out a while with the hope the weather might smooth out a bit. I remember I had started to tune the Narco to the Duquesne frequency to give the tower a call when I heard the unmistakable clatter of a Kinner K-5 and, glancing up somewhat startled, there off the Cessna's port wing was an old Fleet Model 2.

There still are a good many Fleet biplanes scattered around the country—the old Consolidated company in Buffalo built several hundred between 1928 and 1932—so, although unusual, it isn't unheard of to find one. It would be somewhat like looking out of your 1960 Thunderbird while cruising along the local freeway and noting a nice clean Model A roadster—surprising, but hardly unbelievable. But when, a minute later after getting below the base of a broken layer of strata-cumulus, I overtook, near Sullivan, a formation of three more open-cockpit aircraft of the late 1920's, two of which were clearly "elephant ear" OX Travel-Airs while the third was some sort of nondescript parasol monoplane—possibly an early Davis—this at least did border on the unbelievable. It occurred to me at the time that I must have wandered into a local gathering of the Antique Airplane Association and I was looking forward with pleasure to inspecting the old ships because it was apparent we were all letting down toward the Duquesne field. And then a very odd fact suddenly registered.



If you're not familiar with airplanes this may not seem significant, but it is right here that the accident report I turned over to the FAA and the account the FAA was willing to accept began to part company. You see, every one of those four airplanes I'd observed was marked with an "NC" license designation in big bold letters on the upper right wing surface—and that "NC" marking has not been used for years. "N" alone is now used before the numerals. True, a few of the restored old airplanes may still cling to "NC" with government approval, but you have to look a long time to find one, to say nothing of four, all in the air at the same time.

The day after the crash, when I was in the hospital and the FAA safety agent Bill Josephs came over from Terra Haute and first talked with me, it was, I'm sure, right at this point that he began to feel my account was better suited for analysis by a head shrinker than by an FAA inspector. I know that before we ended that first interview he was convinced of this. Undoubtedly it was because of the bizarre features of my story that he arranged for the Civil Aeronautics Board—the agency that reports on all air accidents—to have a representative at the hearing which took place after I got out of the hospital.

Anyway, to return to that flight last August, as I approached Duquesne early in the afternoon, quite suddenly just above the horizon where there had appeared to be nothing, there seemed to materialize a number of gnat-like moving dots. This abrupt, almost instantaneous, revelation of distant aircraft—literally, out of thin air—is actually a common but rarely mentioned phenomenon. It has, I am told, something to do with the way the eye focuses and with the tremendous volume of air space of which we seldom are aware.

I recall that suddenly I found I could distinguish nine airplanes where a moment earlier there had been none, and, as I came closer, it was apparent that most of these were in a landing circuit but real close in to the field boundaries—not like landing patterns are flown today—and, below, there were at least twenty ships, all of the 1920-1930 period, parked in two rows on this small rectangular grass field. On one side was a brilliantly white wooden hangar with a long cloth banner or streamer—black with yellow letters—spread across the space between the opened hangar doors. The banner was blowing about in the wind with the letters all distorted so that I could only make out "Welcome 6th Annu . . .". And painted on one side of the hangar's arched roof were the words "Duquesne Indiana Municipal Airport," and on the other, "Kendall Aviation Products."

Yes, I know—you don't have to tell me—the Duquesne Airport has two unpainted metal hangers and a brick control tower and two concrete runways each 2,800 feet long and the field handles only Shell Aviation products. It has been like that since 1949. Nevertheless, I can only describe the way I saw it on August 10th, 1959 at approximately 1:10 P.M., and at that time as I entered the pattern waiting for those old ships ahead of me to land, there were, on that small turf field, twenty antique airplanes of which at least fifteen were biplanes including several Waco 10's of the late 1920's, three 1929 or 1930 Great Lakes, unmistakable with their distinctive sweepback, a couple of Avians, and a Driggs Skylark along with an assortment—that I couldn't identify—of other open cockpit biplanes, representative of the early 1930's.

I have been questioned by the FAA and by the CAB and by the Indiana Air Safety Commission and each time, when I get to this point, I am asked if I really believed, just before the accident while observing those airplanes of thirty years ago, on an airport that definitely belonged to an earlier day, that I had actually "traveled-back-in-time." Now I have read my share of science fiction and I have some general understanding of the various theories of time and I am open to any reasonable explanation that might account for the facts—except of course, the interpretation that, by virtue of claiming to have seen these airplanes at Duquesne on August 10th last, I am eminently qualified for the looney bin.

For completeness I must add a few facts here: To the best of my knowledge I have never seen any photographs of the Duquesne Municipal Airport as it was at any time in the past. I first saw the field in 1956 and I believe I have landed on its concrete runways three times since then. Yet on August 11, last year, the day after the accident and only barely out of shock, I described the Duquesne airport—the hangar, the airplanes, and the crowd—exactly as it was on August 10th, 1934. It didn't take long for the FAA to establish that fact.

On August 10, 1934—twenty-five years almost to the minute before my 1959 crash—the 6th Annual Indiana State Air Tour composed of some fifty privately owned airplanes flew into Duquesne Municipal Airport from Terra Haute arriving between one and two in the afternoon. The Duquesne *Tribune*—the local paper—reported in a story dated August 10, 1934, that the Air Tour had been routed into Duquesne as part of the dedication ceremonies for the brand-new Duquesne Municipal Airport. Included in this news story was a list of the aircraft in the tour and among these were several Travel Airs, Wacos, Fleets and Great Lakes. And there was also listed one Laird Speedwing which, I maintain, pulled abruptly up into my flight path over the west edge of the Duquesne field, its propeller shearing through the Cessna's left wing and the Cessna's propeller shattering on the Laird's tail surfaces.

The representative of the Air Safety Commission—a fellow named Talbot—asked me, jokingly but with a certain trace of seriousness, when I first talked with him in the hospital, if I had noticed—after regaining consciousness in the Cessna's wreckage or later on the way to the hospital—any "non-aeronautical" signs of 1934. You know—NRA we-do-our-part Blue Eagles, girls in extra long dresses, Auburn or Franklin cars, PWA Project signs—that sort of thing. I didn't, of course, see anything like that, but his question made me wonder if there was some way to separate my attempt to land at what I am sure was the 1934 Duquesne Airport from my crash, seconds later, near the 1959 Duquesne Airport. There isn't much point in trying to derive an elaborate theory—there isn't enough to go on. But I have a general idea that to me suggests what happened.

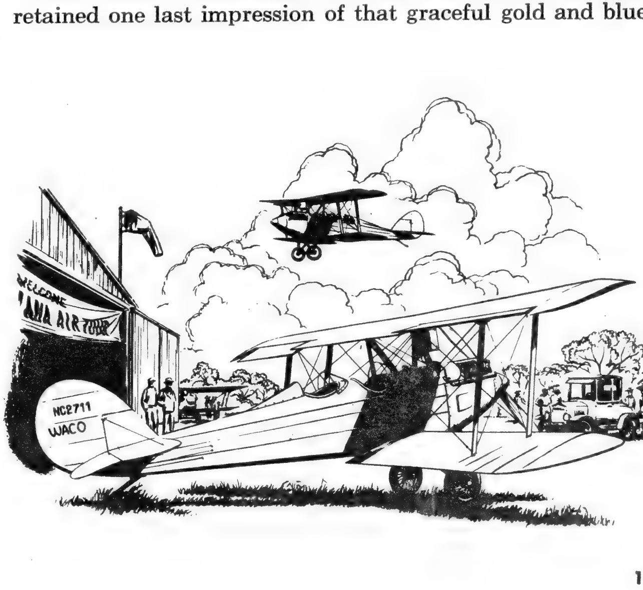
I can not explain why this occurred except to say that it may have had something to do with my approach to Duquesne precisely one quarter of a century after the 6th Annual Indiana Air Tour . . . the only one of the annual air tours, incidentally, to land at Duquesne. Or it may have been related to the erratic, somewhat haphazard course I had flown in avoiding those thunderstorms—or even, perhaps, to the excessive turbulence—there is no way of knowing.

To me it is clear that circumstances did combine in such a pattern that, quite by chance, I attempted to impose myself and a 1959 airplane upon another time, specifically upon August 10, 1934. And if you reflect on it I am sure you will agree, this would have been completely inconsistent with any sane conception of reality. I believe further that if it had not been the Laird which ended my unplanned but deliberate attempt in 1959 to land a contemporary airplane upon an airport in 1934, it would have been something else—say a heart attack or a structural failure of the Cessna.

Of course there was a hearing conducted by the FAA with this Indiana Air Safety man, Talbot, and the CAB representative, an older man I had met once before named Andrew Rollins from the regional office, both sitting in. But before I get into that, there is one more thing about the accident itself: On that August afternoon as I entered the downwind leg of the landing circuit behind a red and white 1931 Verville Sportsman, I noticed for the first time stretched along the eastern side of the field, a long double line of cars and, in front of these, quite a crowd—perhaps three or four hundred people. I had been so engrossed in the aircraft parked along the north edge that not until, as I turned, with the sunlight reflecting from that long line of flat windshields, did I notice the cars and the crowd. And at that exact instant I became aware of a vague uneasiness, a sense of discomfort difficult to describe. A part of it was a sudden awareness of tension and hostility, not from within me but as though it were directed toward me from some intangible, indefinite source. And quite suddenly I felt out of place, unwanted, an unwelcome intruder. This feeling was so unexpected and intense that, without being aware of making a decision, I found I had advanced the throttle and had begun a climbing turn away from what I must unconsciously have recognized as its source.

When, a few seconds later, I realized what I was doing, however, my curiosity and what I thought was only good sense triumphed, and throttling back, I angled once more onto the downwind leg behind the Verville. It was precisely at that moment that the Laird's propeller cut through the left aileron of my Cessna, the roar of its J-4 reached me, and, looking up, I had—and still have—the sharp clear picture of a young face framed by a dark helmet, the goggles pushed up above his eyes, with an expression partly confused, partly shocked, but mostly incredulous. He was looking back from the Laird's rear cockpit over his right shoulder directly at me through the compound curve of the Cessna's windshield—his face not twenty feet from my own.

The Laird's upper right wing panel flashed beneath the Cessna's cowling. I caught a quick glimpse of a pair of "4's" in black numerals on that golden wing surface and, as the shock of impact reached me, the Laird's stabilizer entered the arc of my propeller. Instantly, the Cessna's propeller disintegrated, the tachometer went over against the peg, and the Continental almost tore itself completely free of its mount before my hand could reach the switch. As the Cessna nosed over into a diving roll to the left I retained one last impression of that graceful gold and blue



biplane sweeping upward in a beautiful climbing curve and I think from that very moment I knew I had to own such an airplane.

From the instant of impact with the Laird, the oppressive awareness of being out of place simply ended. I think if at that moment I had been able to take note of the Duquesne Airport I would have seen the familiar paved runways, the control tower and the metal hangers of August, 1959, and not that turf field with its white wooden hangar of 1934.

The Cessna completed two full snap rolls to the left before crashing a mile south of the field in a gully filled with scrub growth and underbrush. It was uncontrollable throughout the descent with the left wing panel well chewed up and incongruously twisted to a negative incidence about the main spar. There were no witnesses to the crash. I regained consciousness in the wreckage in mid-afternoon, and shortly after that two kids hiking through the rough country found me.

During the next two months in the Duquesne hospital, I put a lot of thought on what had happened and time after time I went over every detail trying to figure out what possible combination of actions I had taken—like when and where I had changed course or altitude or even what I had been thinking about—that might lead to some explanation of my brief return to a time one quarter of a century earlier. I could find no clue.

Whatever the combination of events may have been, I knew that I never would be able to duplicate it. I wondered then, if others might have had a similar experience but perhaps, unlike me, not have survived to recount it. And then I remembered the crash of that Mid-American DC-3 at Chicago Municipal during a heavy snowstorm in December, 1939. Jack Cullins, a kid I had grown up with, was the Captain on that DC-3. The ship crashed on final approach east of the field and it was one of the worst airline accidents up to that time—twenty-four fatalities; no survivors. The press had reported in the first news stories of the crash how the tower had heard, just before radio contact was lost, Cullins cry out something like ". . . he's gone clean through the right wing—I don't think we'll make it . . .".

No other crashed or damaged airplane was found anywhere in the area so there was no hint either at the hearing or in the final accident report of the possibility of a mid-air collision. But now I wondered if it might be possible to link this accident with some unexplained—or unsatisfactorily explained—earlier crash near the same location but perhaps as much as a generation before 1939. Chicago Muni—now Midway—has been an airport for a very long time.

Of course the much publicized flying saucer mystery of a decade ago occurred to me, too. I've never seen any of the so-called saucers, but I've talked with too many pilots who have to discount—as the Air Force Project Saucer did back in 1950—the validity of some of those reports. So inevitably I began to wonder if those sightings were not of our own aircraft from some dim time in the future —aircraft that had perhaps by chance or perhaps by plan returned for a brief moment to our time—appearing to us as implausible as, possibly, my 1959 Cessna had seemed to the pilots in the 1934 Indiana Air Tour.

In October of last year the hearing into the Cessna's crash was held in Bill Josephs' FAA office in Terra Haute with, as I have said, the Indiana Air Safety Commission sending over Talbot and the regional CAB sending Andrew Rollins. The whole show took the better part of two days, the first being used to get into the record all the personal and background data these sessions like to include and, late in the day, my detailed statement on the accident. Josephs then dictated into the record the story I had given him the day after the crash along with the remark that, surprisingly, it agreed, detail for detail with the statement I had just given.

Naturally a search had been made immediately after the accident for the Laird which I claimed had flown into the Cessna's left wing. When I pointed out that it seemed unreasonable to look for it in the year 1959, and suggested that the FAA look for it in August, 1934, the comment was treated as a humorous effort on my part. But when copies of the *Duquesne Tribune* for August, 9, 10, and 11, 1934 were brought over and it was read into the record that a Laird Speedwing, license NC 6344, had participated in the 6th Annual Air Tour, somehow it didn't seem quite so humorous. That pair of fours in the license sort of backed me up.

Early in the afternoon of the second day Talbot phoned the *Indianapolis Register* for verification of the Laird's entry in 1934 and for any other information about the airplane that might be in the *Register* files. It turned out that the 6th Annual Air Tour was, apparently, completely free of accidents of any kind, although six of the aircraft that had begun the tour were forced to drop out as the result of "mechanical difficulties." The Laird was listed as one of these. Talbot also learned from the *Register* that Paul Sampson, the owner-pilot of the Laird in the 1934 tour, along with his wife and their two children, were killed in a head-on truck-auto collision February 2, 1940 near Gary, Indiana. At the time of his death his occupation was given as "executive, Turbine Division of National Motors, Indianapolis."

The FAA office staff in Terra Haute had gone through the records of the Duquesne Municipal Airport, page by page, and found no reference to any Laird airplane either hangared or repaired at the field. My Cessna was a total loss, and according to both Josephs and Rollins, the condition of every part could be accounted for by the impact with the scrub growth and the terrain at the crash site.

I have a copy of the findings of this accident investigation here with me and it is clear that the FAA and the CAB tried to find some interpretation that didn't imply I was a compulsive liar or otherwise mentally unbalanced. For example, there is no reference in the findings to an air collision except the following remarks: "Just prior to the accident the pilot stated he had the definite impression of making contact with an aircraft over the west boundary of the field. No aircraft meeting the pilot's description has been located so it is believed that the extreme turbulence following from the persistent thunderstorm activity in the vicinity of Duquesne at the time of the accident, and the presence of other aircraft in the traffic pattern, combined to produce the impression of a mid-air 'brush.' "

The cause of my crash was officially given as "loss of control at a low altitude while maneuvering to land under conditions of extreme turbulence"—which, as any pilot knows, is a polite way of saying that they figured I had stalled the Cessna and spun in while turning from the downwind leg south of the field.

Following the hearing in Terra Haute I went back to St. Louis and, a couple of days later, induced Joe Wallace, our local FAA Safety Agent, to see what Washington could offer on the Laird Speedwing NC 6344. I think it was right then that I knew I had to find this airplane, or whatever remains of it there were, partly because it was one of the most beautiful biplanes I had ever seen, but mostly because I wanted to find out what was written in its log book for August 10, 1934.

It's a very difficult thing to get any information from the FAA on civilian flying in the past because the FAA evolved from the CAA which in turn was organized during the New Deal from the old Bureau of Air Commerce, and this in its turn had developed out of the Aeronautics Branch of the Department of Commerce in, I believe, 1934. At each reorganization the files were re-arranged or thinned out or moved to another office and, because of this, no one today knows for sure what data have been kept and what thrown out. I did learn through Wallace that all non-fatal accident reports before 1941 had been weeded out of the FAA files and there now was no 1934 report of a collision involving any Laird airplane in the files. There probably never was.

All I could get from the FAA was the fact that the Laird had last been re-licensed in Indianapolis in 1937 while still owned by Paul Sampson. After that the ship might have been destroyed through neglect, or fire, or a non-fatal crash. Or it could have been sold in Canada or Mexico, or, conceivably, still be flying illegally in the U. S. There was no way of telling and it looked like a hopeless job to track it down.

But I went over to Indianapolis the first chance I had, I think it was late in November, and I found through National's Turbine Division there, that Paul Sampson had a brother who, back in 1939, had lived in Chicago.

I wrote to the brother—a Jerome Sampson—at the address National had given me and, somewhat to my surprise since the address was so old, I had an answer right before Christmas. During the holidays I managed to make it to Chicago and I had a long talk with him in his home. He remembered that his brother Paul had, with his wife and the older of their two kids, started out in the Laird early in the summer of 1937 for a vacation in California. But they had some kind of mishap in Iowa on the first day of their flight and had gone on by airline from Des Moines. Jerome Sampson knew nothing of the Laird after that—he thought perhaps Paul had sold it in Iowa. Again it looked like a dead end.

But then I heard about the Iowa State Aeronautics Commission, an agency that goes back to 1929 and which, I was told, as part of its work, keeps a complete file on all aircraft accidents in the State of Iowa. When I got to the Commission's office in Des Moines early last January, it didn't take over five minutes to find the report. It was brief but complete: Paul Sampson had made a precautionary emergency landing to avoid flying through a line squall at the Eola, Iowa Municipal Airport, some seventy miles east of Des Moines, close to the Iowa River, on June 10, 1937 at 3:15 P.M. While taxiing up to the hangar, a gust of wind from the squall had turned the Laird on its back. No one was hurt but the damage was listed in the report as "all spars broken in right panels; rudder and fin and propeller demolished." Under the heading *Disposition* was a note signed by Paul Sampson: "Disassembled and stored NC 6344 at Eola Iowa Airport."

And that was the way the search ended . . , the Laird was there, jammed in the rafters of that decrepit structure on what was once the Eola Municipal Airport. It wasn't in such bad shape all things considered. The fabric was torn in places and altogether dead after 22 years and the Wright J-4 was a mass of rust. But the airframe was sound and all of the dural and wood seemed restorable.

I found the log books right where they belonged in that special compartment provided in all Laird aircraft behind the luggage space. Maybe you don't know about airplane logs. Well, all aircraft, like all sea-going craft, are required by law to maintain a log and the pilot as "Captain" is legally bound to see that the entries are kept up to date. This is, of course, a tradition taken over from the sea, and although sometimes it's a nuisance, I think most pilots never seriously question the tradition, perhaps even getting a kick out of playing the role of "Captain." Without exception every thing that is ever done to an airplane is entered in its log, every repair, however slight, every alteration, every inspection and every damage no matter how minor. All flights are entered including where and when the airplane was flown and the time that it was airborne. Scattered through the log books are forms for the inspections required by law and places for the mechanic or the inspector to certify the work done or the inspection made.

The Laird's log was one of the old kind put out by the Jameson Airplane and Supply Company of Dayton, and I found the August 10, 1934 entry I was looking for scribbled across one of the pages that have the printed caption "Periodic Inspection Report to be Made After Each 100 Hours of Flight." The entry reads: "At 1:15 P.M. August 10, 1934 while executing a spiral approach to the Duquesne Indiana Airport, an unknown, apparently experimental, enclosed monoplane with an angular appearance and a 3-wheeled Curtiss pusher type undercarriage, cut across in front of NC 6344 seriously damaging the stabilizer, flippers and rudder and slightly damaging the propeller of this aircraft. As the rudder and flippers became almost immovable, a gradual straight ahead descent on a southwest heading was made and a landing was effected at the Vincennes Airport, 34 miles from Duquesne, at about 1:40 P.M." It was signed "Paul Sampson."

On the following pages in the log are entered all of the repairs made. The work was certified by a John P. Quigley, a licensed "A and E" mechanic, who probably also operated the Vincennes airport since he test flew the Laird on October 3, 1934 certifying this with his signature followed by "T 7749" which indicated he held a transport pilot's license. On October 4, 1934 the log shows that Paul Sampson flew the Laird back to Capitol Airport, Indianapolis where, apparently, it was normally hangered.

I don't know if the Cessna Aircraft Company will appreciate that 1934 description of their 1959 tricycle landing gear model 182, particularly with its reference to the "Curtiss pusher type undercarriage." But after all, in 1934 the aircraft industry had not yet re-discovered the tricycle landing gear that Glenn Curtiss was using back in 1910.

I took the log books to St. Louis and turned them over to Joe Wallace at the FAA office and, when the Laird was trucked in to my home, Joe and a fellow named Harriman, new in the St. Louis FAA office, came over and we stripped all the fabric off the airframe and took the stabilizer apart piece by piece. I still had a vivid picture of the Laird's tail surfaces going through the Cessna's propeller and I had a hunch we might learn something. So I had my Graphic on the tripod and we exposed sixteen sheets of film showing every step of our work on the stabilizer. That John Quigley who had rebuilt the tail surfaces in 1934 was a real mechanic. It was difficult to distinguish his work from that of the Laird factory; his casein joints in the stabilizer were sound after 25 years and there was none of those glue smears or clamp marks so often left by aircraft repair shops.

When we got to the stabilizer spar we discovered Quigley had attached a plywood reenforcing "doubler" along its face. When we removed this we found a deep indentation in the spruce spar and, almost invisibly embedded in this, apparently unnoticed by Quigley, we found a small, raggedly torn aluminum fragment. We dug it out and pounded it flat and it was a part of a manufacturer's identification tag. On it, easily decipherable, was inscribed ". . . amsey Constant Speed Model O." My Cessna 182 had been equipped with a McRamsey Constant Speed "type O" propeller; the McRamsey company did not exist until 1954.

A few days ago Joe Wallace and I sent to the CAB regional office the Laird's log book, a set of 16 photo prints showing our work disassembling the stabilizer, and the spar itself with the McRamsey aluminum tag. Wallace says the CAB will study all of the 1934 entries in the Laird's log with the greatest care and will subject the spar and the aluminum tag to every possible scientific test to determine beyond question the age of the spar and the origin of the tag. But in spite of these tests and the evidence, he predicts the CAB's official finding can only be that the whole thing is an elaborate hoax, an involved "spoof," a practical joke carried out in the most complete detail imaginable.

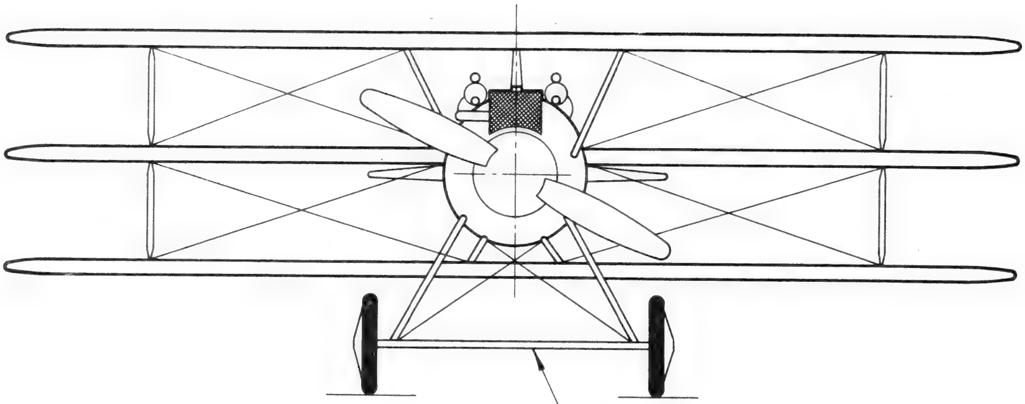
I think Wallace's prediction is wrong.

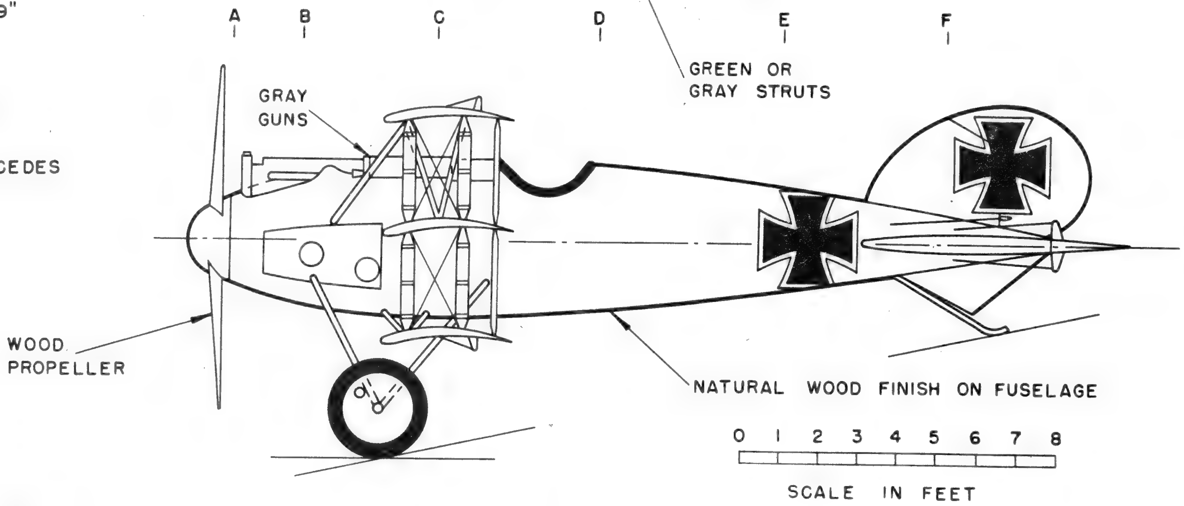
You agree?

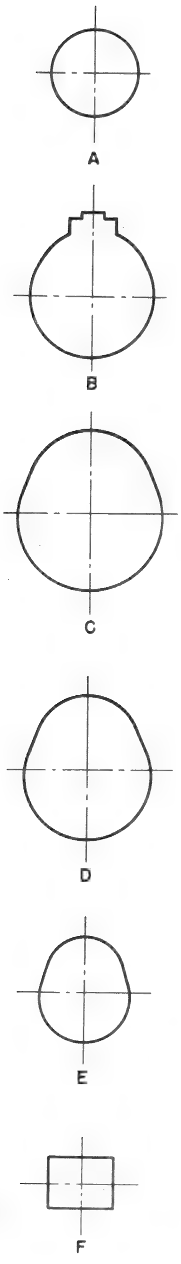
ALBATROS TRIPLANE

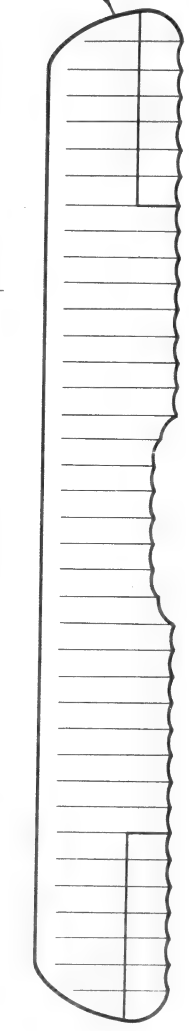
SPECIFICATIONS

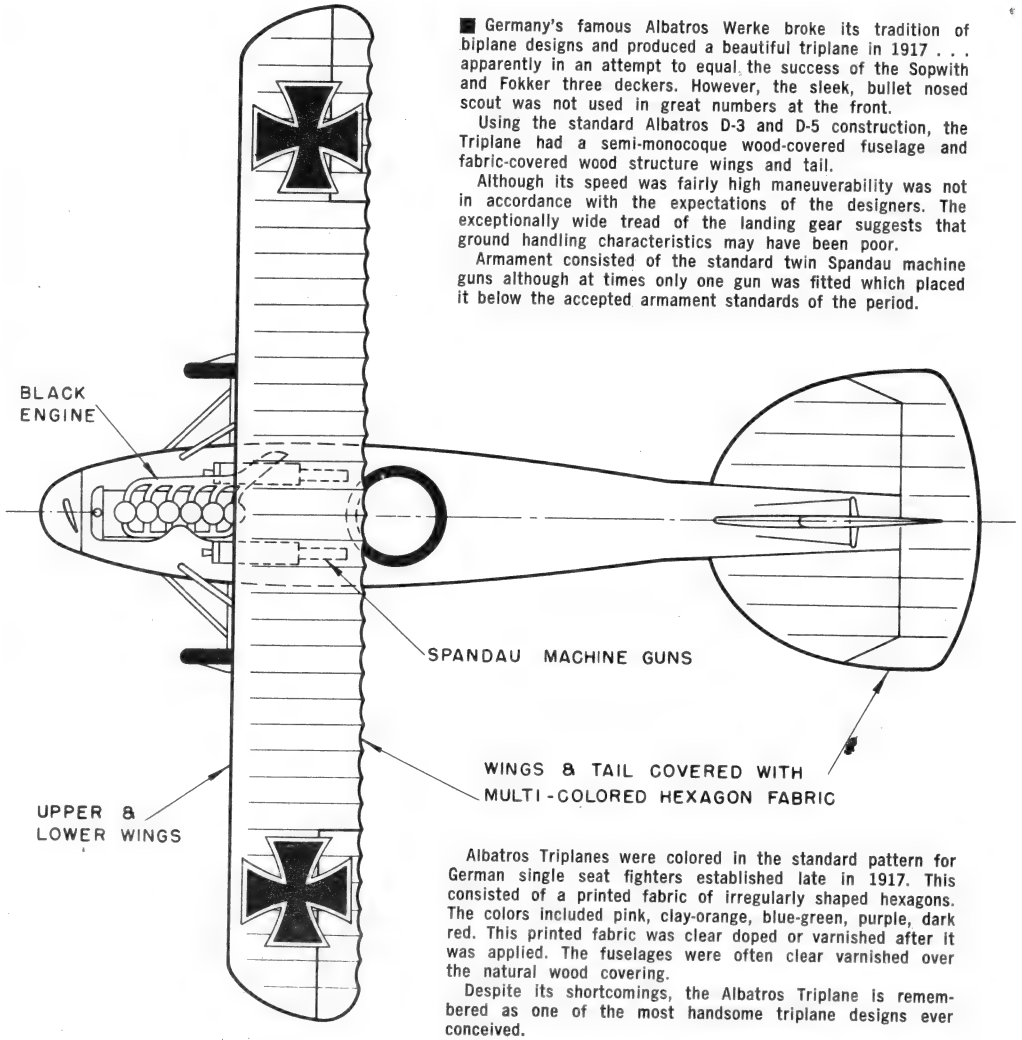
TOP SPEED	132 MPH
WING SPAN	25'-8"
LENGTH	23'-11"
HEIGHT	8'-9"
HORSEPOWER	160
CYLINDERS	6
ENGINE MFR.	MERCEDES











■ Germany's famous Albatros Werke broke its tradition of biplane designs and produced a beautiful triplane in 1917 . . . apparently in an attempt to equal the success of the Sopwith and Fokker three deckers. However, the sleek, bullet nosed scout was not used in great numbers at the front.

Using the standard Albatros D-3 and D-5 construction, the Triplane had a semi-monocoque wood-covered fuselage and fabric-covered wood structure wings and tail.

Although its speed was fairly high maneuverability was not in accordance with the expectations of the designers. The exceptionally wide tread of the landing gear suggests that ground handling characteristics may have been poor.

Armament consisted of the standard twin Spandau machine guns although at times only one gun was fitted which placed it below the accepted armament standards of the period.

Albatros Triplanes were colored in the standard pattern for German single seat fighters established late in 1917. This consisted of a printed fabric of irregularly shaped hexagons. The colors included pink, clay-orange, blue-green, purple, dark red. This printed fabric was clear doped or varnished after it was applied. The fuselages were often clear varnished over the natural wood covering.

Despite its shortcomings, the Albatros Triplane is remembered as one of the most handsome triplane designs ever conceived.

The Plane That "Sold" Air Travel

By Douglas J. Ingells

■ The chilly March wind whipped a drizzling rain against the faces of the small group of air travelers boarding the airliner at Kansas City. Early morning fog already had delayed the flight for more than an hour. But now, the grey stuff had lifted and the Transcontinental & Western Air trimotored transport was ready for departure.

"The sun's shining in Wichita, our next stop," declared Captain Bob Fry, a TWA veteran. "It might get a little bumpy, but she can take it."

He was talking to Knute Rockne, the famed Notre Dame football mentor, who was flying to Hollywood to be technical advisor on a feature picture. They were the last to board the 10-passenger, plywood and cloth-covered Fokker F-10 skyliner.

It was March 31, 1931.

The plane was airborne at exactly 9:15 A.M. Less than an hour later, it lay a twisted, smoldering mass of wreckage on the farm of Stewart Baker, near Bazar, Kansas. Eye witnesses said the plane came tumbling down out of the clouds with parts of its wing fluttering after it. With a terrifying sound, the ship hit, nose first, in the field, exploding in a ball of fire and smoke.

Rockne, Fry, Jess Mathias, the co-pilot, and five others perished. It didn't matter how it happened, or why it happened, public reaction to the accident which claimed the life of one of the best-loved sports figures of all time, seethed with condemnation of air travel.

The Rockne incident was a staggering blow to the struggling, infant scheduled air transport industry. It put the spotlight on aviation's faults and mistakes, not its progress and accomplishments. As a result it started a revolution in equipment, a trend toward bigger, faster, safer planes and improved operations.

Hardest hit, understandably, was TWA whose Fokker trimotor planes were the prime target of criticism. The fact is, Bureau of Commerce inspectors, who at that time had jurisdiction over the commercial airlines such as they were in the early 'thirties, "red-tagged" the Fokkers, compelling periodic inspections of the plywood wings which made operating the planes economic suicide. The airline was desperate. It turned first to the all-metal Ford trimotors, but they were too noisy and cumbersome.

Taking another approach to its problem, TWA began immediately programming for a super skyliner that was destined to revolutionize air transporation. Jack Frye, then Vice-president of Operations for TWA, wrote letters to several of the aircraft manufacturers, shopping for a designer and builder of the plane TWA had in mind. One of these letters was addressed to Donald W. Douglas, President of the Douglas Aircraft Company, Santa Monica, California.

"That letter," recalls Douglas today, "thrust the company precociously into the commercial air transport manufacturing business. We call it the birth certificate of the DC-ships (the initials stand for *Douglas Commercial*) whose performance records and exploits have become legend all over the world."

Frye's letter stated specifically the design requirements that TWA desired—an all-metal monoplane (a biplane would be acceptable) capable of carrying at least twelve persons with ample room in a comfortable cabin. The ship must have a cruising speed of 140 to 145 miles per hour, a service ceiling of 21,000 feet and a range of 1,080 miles. It must be able to carry a payload—passengers, mail and crew—of not less than 2,300 pounds. The plane must also be fitted with latest radio communications equipment, air navigational aids, instrumentation and lighting for night flying operations.

It was the kind of a challenge that stirred the Scotch blood of the young, 38-year-old Don Douglas, whose planes, including the "World Cruisers"—army biplanes which circumnavigated the globe in 1924—already were world famous. Douglas, with an eye to the future, gave Frye's bid invitation priority attention.

For a solid week, night and day, the plane designer huddled with his engineers and production staff. Men like J. H. "Dutch" Kindleberger, chief engineer, Arthur E. Raymond, his second in command, Fred Herman, Lee Atwood, Ed Burton and Fred Stineman, senior designers and Harry E. Wetzel, vice-president and general manager, were all in on these preliminary discussions. Behind closed doors, they worked out the design proposal that Douglas planned to submit to TWA.

They arrived at four broad conclusions: (1) The plane would be bimotored instead of trimotor. (2) It would be a low-wing monoplane, all-metal "honeycomb" wing construction with a semimonocoque fuselage, the wing and body covered with stressed aluminum skin. (3) It would have a retractable landing gear to take advantage of streamlining. (4) The plane would be designed and built with an emphasis on passenger comfort, as well as speed and safety.

Ten days after the receipt of the Frye letter, Raymond and Wetzel were on the train enroute to New York where they presented the design proposal to the TWA people including Frye. Colonel Charles A. Lindbergh, the airline's technical advisor and most famous stockholder, and Richard W. Robbins, TWA president. According to Raymond, now Senior Vice-President at Douglas, the airplane people liked what they saw on paper. It was more than just another airplane . . . it was a whole new design concept.

"Lindbergh, however, wanted a pretty steep guarantee," Raymond recalls. "He told me they would buy the design—provided the ship could take-off with a full load from any point along the entire TWA route on *one engine!*"

Raymond claims he took out a slide rule and did some fast calculations. "The answer came out ninety per cent YES and ten per cent NO," he says. "But that ten per cent kept me awake nights. It was up to Douglas whether we could put the company's reputation on the line to guarantee something which had never been tried before with an airplane of this weight category."

Back in Santa Monica Douglas asked Kindleberger about the one-engine performance requirement. Was it possible?

"Hell," Kindelberger said, "there's only one way we'll ever find out; that's to build the airplane and try it."

On September 20, 1932 the contract was signed and Douglas sent the work order down to the shops to start the DC-1. The price for one airplane was set at $125,000 with an option that the airline could buy all or part of sixty additional airplanes at $58,000 apiece. Nine months later the DC-1 was rolled out of the factory.

Silver and sleek, she was the biggest land-plane ever built in this country as a bimotored monoplane design up to that period. The fuselage measured 60 feet, nose to tail. The body was oval-like in cross-section, fish-shaped in profile. There were twelve seats in the cabin, two rows of six on each side and a big square window by each seat. The seats were more like the comfortable lounge chairs in a railroad parlor car than the seats in an airliner. The interior of the plane was roomy enough with Pullman fixturers, so that even lanky, Charlie Lindbergh could stand up straight and walk around. It was one of the features he remarked about when he inspected the ship for the first time.

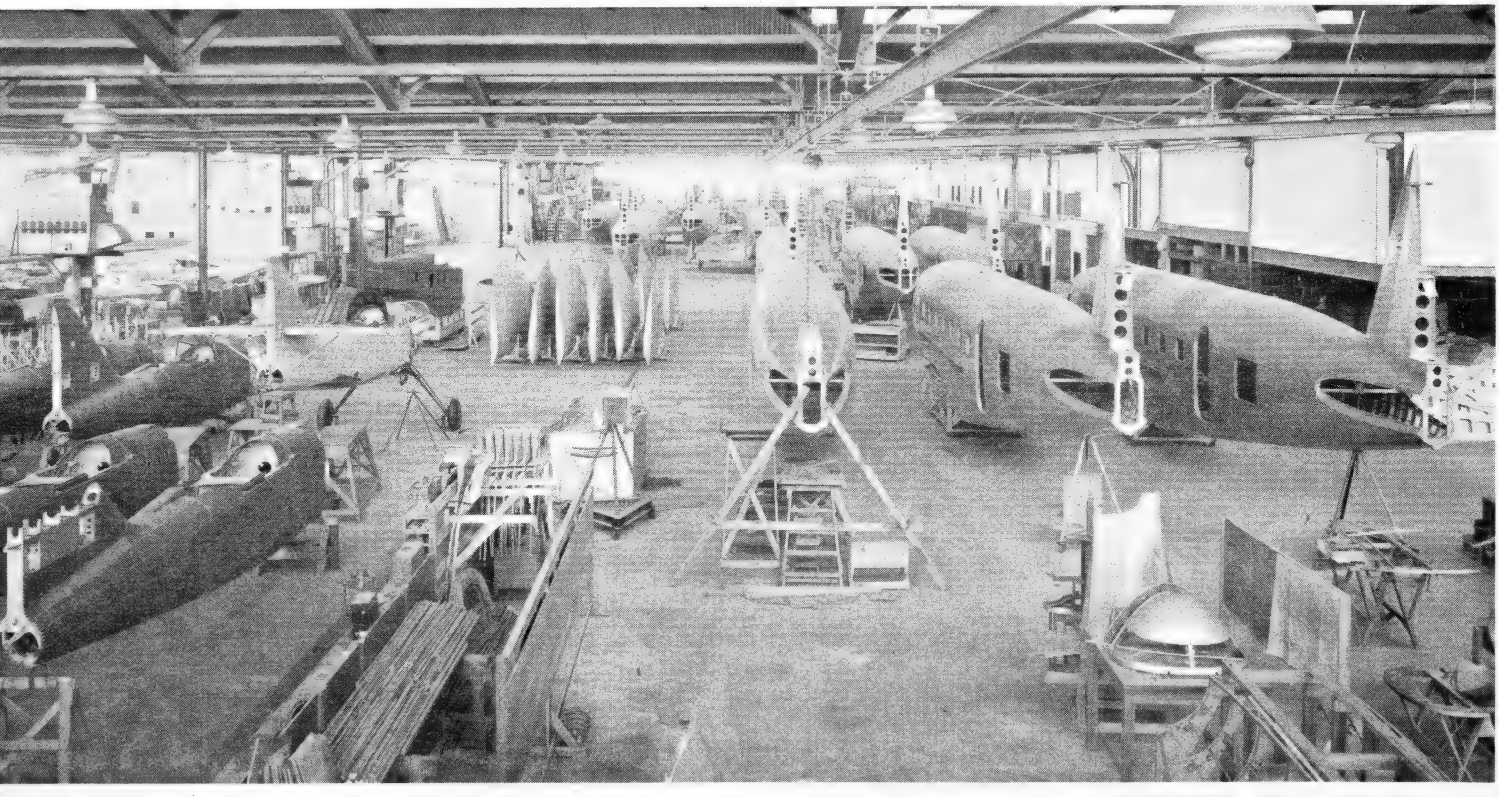
Sound-proofing made the cabin quieter than any previous aircraft, for the first time passengers could converse without shouting at the top of their lungs. Inside, cabin temperatures could be kept at 70 degrees even when it was 30-below at high altitudes. Near the door of the fuselage was a small galley for preparing meals aloft. In the extreme tail was a small lavatory complete with wash basin and toilet. The DC-1 had built-in comforts and conveniences that no other airliner ever had offered to the traveling public.

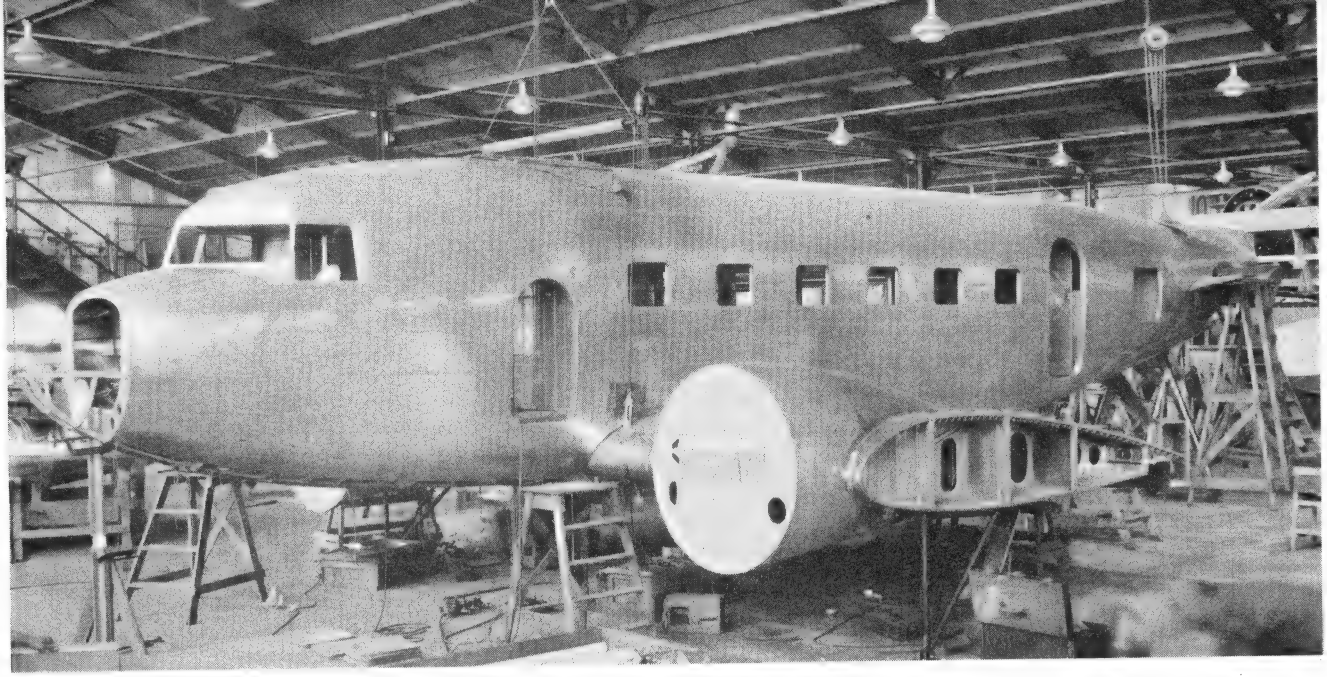
A low-wing monoplane, she had a span of 85 feet, wing tip to wing tip. The plane rested on two main wheels and a small tail wheel. The main wheels could be retracted into streamlined engine nacelles which were located on a stub wing center section integrated right into the fuselage structure, one on each side of the body.

Powered with two Wright "Cyclone," 710-horsepower, nine cylinder, radial, air-cooled engines, the plane had as much power as a giant locomotive. The ship was fitted with the latest Hamilton Standard three-bladed, controllable-pitch steel propellers.

Up front, in the nose, was the pilots' compartment with two sets of controls and side-by-side seating arrangement for the pilot and co-pilot. The plane was also equipped with the Sperry Gyroscope Corporation's automatic pilot which could fly the ship without human hands touching the controls. It marked the first time that a commercial transport had a "third pilot" aboard.

Admittedly, all of these things weren't new. They had been tried on other airplanes. But the DC-1 brought them all together in a single airplane for the first time.





This posed a major problem, almost a crisis. The built-in plush and plumbing made the airplane overweight. The finished airplane weighed almost a ton more than the design had called for. Engineers shook their heads. It was too much weight to ask for the design. She would never pass the single engine take-off test!

Even Don Douglas was a little concerned. "We were gambling on a couple of hole cards," he explains. "One was the fact that the engine people had greatly improved the power output of the engines since we had laid down the initial design weights. The other was the advantage afforded by the controllable-pitch propellers."

"This new propeller gimmick was more like two aces back to back," he points out. "It meant the pilot could automatically adjust the propeller blade angle to take bigger bites of air at take-off power, providing enough additional thrust to lift the heavier loads. At the same time, the size of the 'bite' could be automatically decreased for cruising speeds so the engines wouldn't eat up all the gasoline too quickly and burn themselves out."

Douglas folks considered the variable pitch propeller one of the major advancements in aircraft powerplants. They were soon to find out how good it was. Saturday July 1, 1933, the DC-1 was out on the line at Clover Field, adjacent to the plant, ready for its initial test flight.

Here's how Douglas, himself, describes what happened:

"It was a bright, clear day and a slight breeze was blowing in off the ocean when I got down to the flight line.

"Carl Cover, our chief test pilot and Fred Herman, the project engineer on the DC-1 who went along as an observer, climbed aboard the plane. Cover taxied the ship down to the far end of the runway at the east end of the field. He gunned the motors for a minute, and then she came roaring back.

"The DC-1 was airborne at exactly 12:36 P.M. by my watch.

"Seconds later, the port engine sputtered, then quit. Looking up, we saw the plane's nose dip sharply. But Cover pulled her up a few hundred feet, and I thought the remaining engine, by its roar, would tear itself loose. What happened was worse. There was no sound at all. Both engines had conked out!

"This time the nose dropped at a precarious angle. Then, suddenly, the engines came to life again. But only for a moment. Once more there was silence. We thought sure the plane was going to crash. But for the next five minutes we saw a demonstration of flying that would put even the best circus performers to shame. Cover was a master.

"He would gun the engines. There was a roar and the plane would climb sluggishly. Then, the engines would quit, momentarily, and the nose would drop. But, for some unknown reason, when the nose dropped, the engines would start up again. It went on like that, over and over again, with the ship flying a saw-tooth pattern. But somehow, Cover, always managed to gain a little more altitude.

"Finally when he got it up to about 1,500 feet, he excuted a graceful bank, and virtually without any power at all, coaxed it down to a rough, but safe landing.

Fortunately, there was nothing wrong with the basic design of the airplane. Cover was well satisfied with its flying characteristics. The trouble was a mechanical bug-a-boo. They finally traced it a a carburetor feed-line installation. Corrected, the plane was in the air again in a few days.

For the next month and a half the DC-1 was subjected to a gruelling test program. Douglas test pilots flew the rivets off the new transport. What they didn't wring out of it, TWA pilots did. Jack Frye, himself a qualified airline pilot and D. W. "Tommy" Tomlinson, the airline's project officer on the DC-1, also put the plane through its paces. After that, Les Hollobeck and "Colonel" Joe Marriot, Bureau of Air Commerce inspectors, took over and gave the DC-1 its blue ticket—the license to serve as a common carrier.

There were incidents during the test program that made the ship prove its prowess. One time, for instance, somebody put the wrong kind of fluid in the automatic pilot and the controls jammed. It took the strength of two men on the wheel to get the plane down.

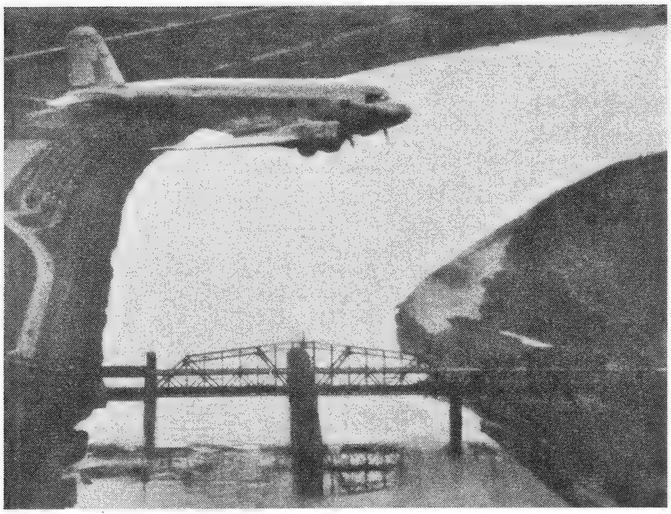
On one of the early flights, the ship passed a test which definitely wasn't on the program. They were running some landing tests with Eddie Allen, another test pilot at the conrols, Tomlinson riding co-pilot and "Doc" Bailey Oswald, chief aerodynamicist along with Franklin R. Collbohm, Chief of Flight Test aboard.

Collbohm, who today is Chairman of the Board of the Rand Corporation, remembers the incident as though it happened yesterday.

"The ship had shown some tendencies to be a little tail heavy," he relates. "A perfect three-point landing was a mite tricky. We wanted to measure accurately the angle of the wheels in landing and which hit first, the main wheels or the tail wheel.

"I was lying flat on the floor with my head stretched as far out the open door as possible, trying to watch the landing gear.

Douglas' Santa Monica plant May, 1934 (left). Workers numbered about 1,500. DC-2's move down production line; at far left are Army UO-28's and Douglas Amphibian. Top of page, DC-1 fuselage under construction. The two photos are dated one year apart: 5/11/33 and 5/11/34.



The DC-1 ("Old 300"—see number on tail in lead photo) nears Kansas City on record-breaking transcontinental flight with last load of mail on Feb. 19, 1934. At controls are Rickenbacker and Frye. Plane proved airlines had made great strides in equipment progress, could handle the mail.

She Sold Air Travel

"The tail hit first, all right. But I noticed she was settling awful fast. The next instant, I got a face-full of tar and rocks. Instinctively, I knew what happened. The wheels were still up and the propeller tips were chewing up the runway."

In the cockpit, Allen and Tomlinson had gotten their signals mixed. It wasn't really their fault, either. Collbohm had been standing between the two most of the time during the preceeding landings. Each time, he had worked the hand pump which raised and lowered the gear. When he went in the cabin, Oswald took his place. Allen and Tomlinson thought it was Collbohm standing there, and they didn't deviate from the past procedure. But nobody had told Oswald anything about lowering the gear!

There was no damage except a couple of bent prop blades. A belly landing with wheels up! It tickled Don Douglas when he heard about it and learned there was no serious damage. "I don't see how Lindbergh and Frye missed that one," he remarked. "They should have made it one of the requirements."

In succeeding tests they "sand-bagged" the ship with a maximum load and it took off without any trouble in 1,000 feet of runway. Wing flaps, which were also an innovation on the DC-1, enabled it to land and come to a stop in about the same distance.

Flying a measured course at various altitudes, the DC-1 hit a top speed of over 220 miles per hour. That was racing plane performance.

Then, came the day for the most important test of all—the single-engine take-off. It was September 4, 1933 and Eddie Allen was the pilot, Tomlinson, co-pilot. The site selected was Winslow, Arizona, elvation 4,500 feet above sea-level—the highest airport along the TWA system. In the thin air, the engines would have to work overtime. As Douglas put it . . . "Frye was making us play with the blue chips."

They had worked up a definite plan for the tests. The first time would be just a dry run. But half-way down the runway, Tomlinson was to throttle half-way back on the engines and they would try it first under these odds. They didn't want to risk everything the first time, in case it really was asking too much of the one engine to pull the load.

On the first run the plane started down the runway with both engines wide-open. At the half-way mark, there was light under the wheels and she was airborne. But Tomlinson didn't reach for the throttles as per the plan. Instead, he reached up and cut the ignition switch, killing the starboard engine!

Allen, startled, but alert, poured the coal to the remaining engine. The ship shuddered and shook, but she didn't falter. Neither did it lose any altitude. It simply began a slow steady climb to about 8,000 feet, well above the jagged, mountaneous terrain. At that altitude, Allen levelled off and—still flying on one engine only—he flew the ship over the pass and landed at Albuquerque. New Mexico, about 280 miles away.

Later Tomlinson explained his action, a little bit apologetically to his friend Eddie Allen. "You work for the company," he said. "I work for the airline. We just wanted to make sure."

On the strength of the DC-1's performance, TWA placed an order for twenty of the new transport planes. These ships were designated, DC-2's. There was only one DC-1 aircraft ever built. The DC-2's were bigger with ten feet more wing, a longer fuselage capable of carrying 14 instead of 12 passengers.

Overnight, they were a sensation. Orders came in from airlines all over the world. When they went into service the planes cut coast-to-coast travel time to 15 hours on the time-table. In their first year of operation they were primarily responsible for doubling the number of passengers carried by the family of airlines. The day of the skyliner had finally arrived.

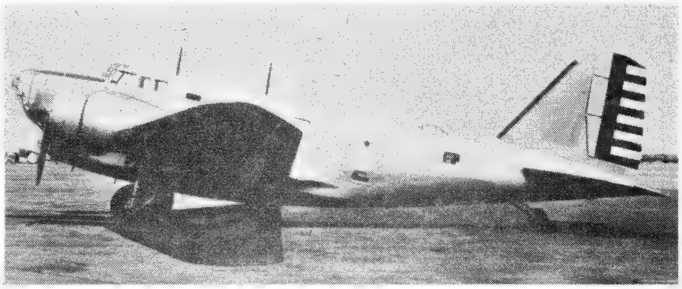
Altogether they built 138 DC-2's, the offspring of the DC-1 prototype. Although the first airplane had cost $300,000 and Douglas actually lost almost a quarter of a million dollars on the first TWA mass order, sales boomed and the company became the leader in the commercial transport field.

The real "break", however, came in the summer of 1935 when Douglas got a call from C. R. Smith, president of American Airlines. Smith wanted a sleeper plane to compete with United Air Lines and TWA on the transcontinental run which American had recently acquired. He talked Don Douglas into building the ship.

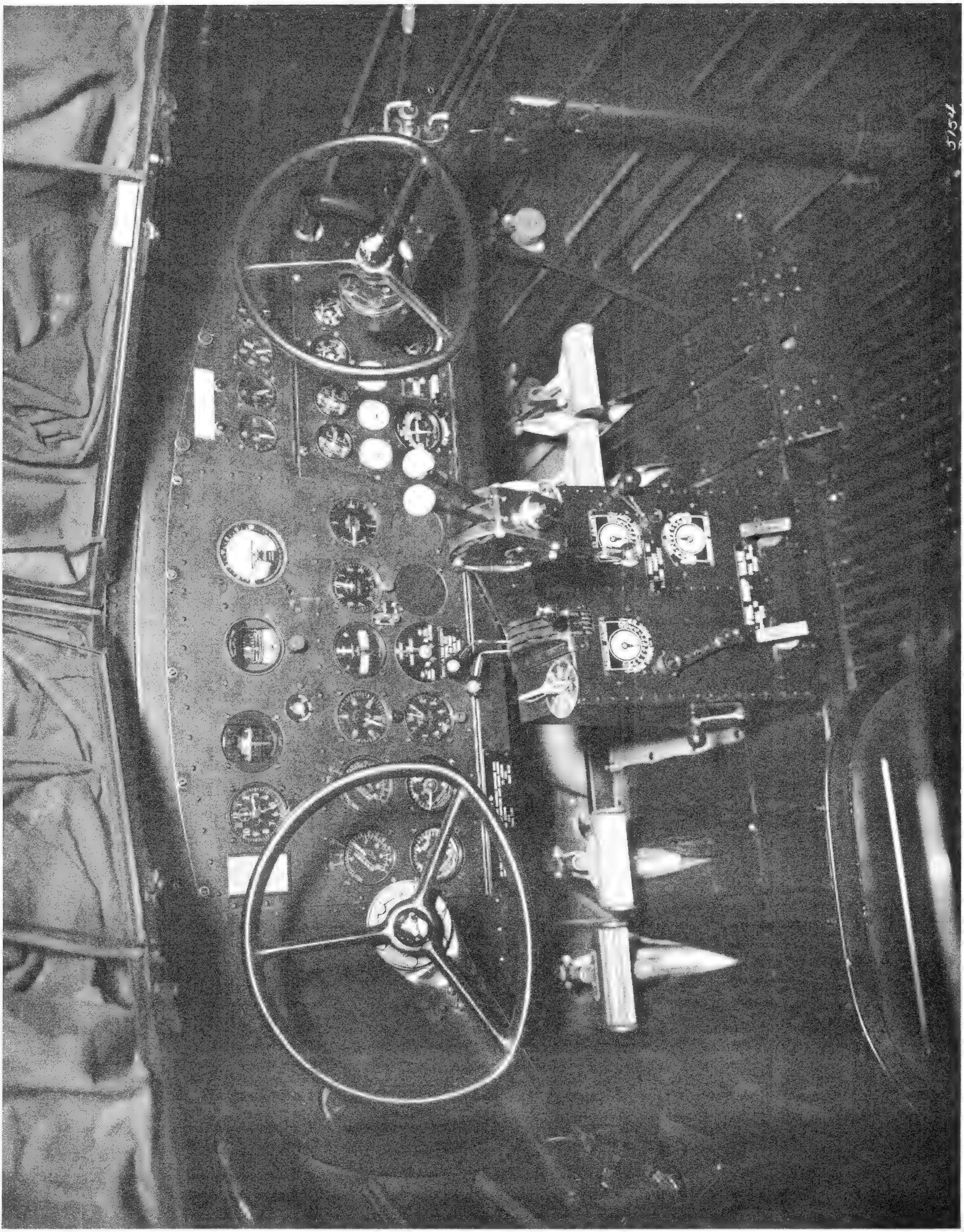
Soon afterwards, the DST came into being—the Douglas Sleeper Transport. Basically, it was nothing more than a slightly larger DC-2 with a fuselage interior modified to accommodate seven upper and seven lower berths—a true Pullman of the skies. When they built the DST, they also made a day-plane version capable of seating 21-passengers. Designated the DC-3 it became the Model-T of civil aviation and the workhorse-with-wings of World War II, the plane President Eisenhower listed as "one of the four weapons that helped most to win the war."

Before that even, the plane received due recognition. On July 1, 1936—three years to the day after the DC-1 had made its initial flight—Don Douglas stood before the President of the United States to receive the Collier Trophy, aviation's most coveted award, for the development of "the outstanding twin-engined transport plane."

"This airplane," President Roosevelt said, "by reason of its high speed, economy, and quiet passenger comfort has been generally adopted by transport lines throughout the United States. Its merit has been further recognized by its adoption abroad and its influence on foreign design is already apparent."



Douglas B-18 was military version of DC-2 airliner. Speed was 214 m.p.h. 18A had nose modification.



The DC-1 cockpit was without frills. Plane was first commercial airliner to employ automatic pilot (center), instrument lighting features, and night-flying navigational aids.

She Sold Air Travel

The honor rightfully should have been bestowed upon the DC-1, the plane that few people ever heard about. For there is little question that it was the plane that changed the concept of air travel. As someone has said, it took millions of groundlings and made them air-farers. The family of DC-2's and DC-3's, it has been estimated have carried, in airline operation, alone, more than 360,000,000 persons, approximately 86,700,000,000 passenger miles while logging 75,000,000 hours of flying time. More than 3,000 at latest count are still flying in daily operations. "You can crack one up," pilots say, "but it will never wear out."

Officially delivered to TWA in December of 1933, the DC-1 was used as a "flying laboratory" along the airways. Occasionally, it carried passengers and flew a regular run, but primarily it was used for experimental purposes.

Monday, February 19, 1934 was a memorable date in its lifetime. With Jack Frye as pilot and Eddie Rickenbacker as co-pilot, the ship, its nose filled with mail sacks, was winging its way across the continent on a record-breaking dash. It carried the last load of mail to be flown by a commercial airline as a result of FDR's famous Air Mail contracts cancellation order ten days before. Frye and Rickenbacker wanted to prove the airlines were better equipped to fly the mail than the Army fliers.

The DC-1 crossed the Rockies at about 14,000 feet. Refuelling at Kansas City, it roared eastward in foul weather to Columbus, Ohio. East of the Ohio Capital, over the "Hell Stretch" of the Alleghenies, it encountered blizzard conditions and they took the plane to 19,500 feet, zipping along with the aid of a tail-wind at 230-mph, high above the adverse weather. Shortly before noon, they landed at Newark just as the weather socked in and closed the field—11 hours and 5 minutes flying time, coast to coast. They had proved their point.

"This new plane," editorialized one New York newspaper, "has made obsolete all other air transport equipment in this country or any other."

Later in 1934, the plane was loaned to the Department of Commerce and the Army Air Corps for experiments that linked together the automatic pilot and the radio compass. It was the beginning of fully automatic flight devices.

The following year the DC-1 was the plane selected by the National Aeronautic Association (N.A.A.) for an attempt at various world speed, distance and weight-carrying records. Altogether in three days, the plane smashed nineteen different records, raised the prestige of U.S. aviation among the nations of the world.

These contributions completed, the DC-1 was sold to millionaire sportsman, oil man and movie producer Howard Hughes, who was planning a round-the-world flight. Originally, Hughes had his eyes on the DC-1 as the plane to use. But after exhaustive tests with the plane, he decided on the newer Lockheed 14, a faster ship which made the flight around the world in 81 hours.

After that the DC-1 was forgotten until 1938 when Hughes sold it to Viscount Forbes, the Earl of Granard, who was planning a Trans-Atlantic flight. By this time, the plane had racked up more than 1,300 flying hours. But it was still good for a lot more.

It never did fly the Atlantic. Forbes cancelled his flight. But the DC-1 went across the ocean, anyway, on the decks of a sea-going freighter. For the next few months the plane, operating under the license registration G-AFIF, a British ticket, flew all over Europe. Then, Forbes finally sold it to a French company and for a long time nobody heard of its whereabouts.

Suddenly, however, it turned up in war camouflage, flying as a personnel transport and reconnaissance plane for the Republican Forces in the Spanish Civil War. When all was hopeless and the Republican Government collapsed, the heads of government climbed aboard the DC-1 and flew over the Pyranees to France. Attacked by Nationalist fighters, the plane out-maneuvered them and permitted the government leaders, to escape with their lives.

The Civil War over in Spain, the DC-1 was turned over to the *Sociedad Anonima de Transportes Aeros* which later became Iberia Air Lines. The war paint was scraped off and its fuselage once more in civilian garb, the DC-1 began flying the airline route between Seville, Malaga and Tetuan.

Rechristened "Negron," named after a famous Nationalist pilot who was killed in the war, the plane flew back and forth, day in and day out, until one day in December, 1940. Then it happened.

On this fateful morning, the plane came in right on schedule from Tetuan, landing at the airfield near Malaga. It took on several passengers and some mail. The door was slammed shut. The chocks removed from the wheels. (It never did have brakes . . . these came later in the DC-2.) And it taxied out to the end of the runway for a routine take-off.

According to an Iberia Air Lines' pilot, who saw what happened in the next few moments—"The plane came roaring toward us. Then, suddenly, when her wheels were only inches off the ground, one engine sputtered and quit. The next instant she was mushing down on her belly in a cloud of dust. When the dust cleared away the plane was a pile of junk at the end of the runway."

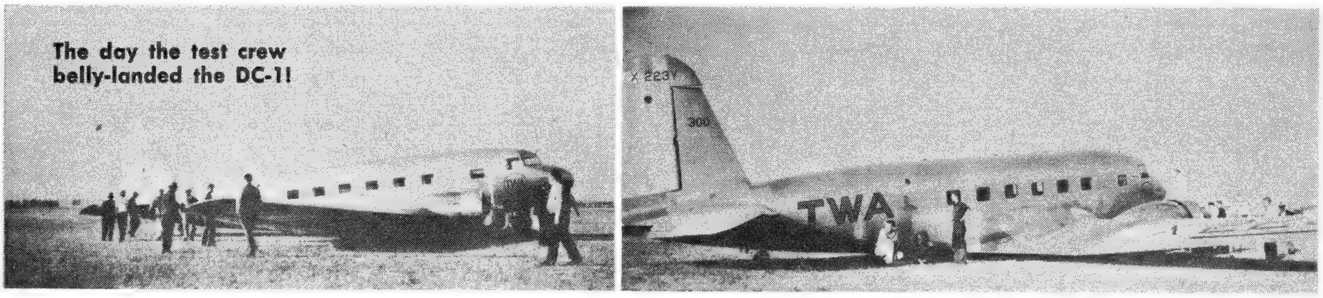
Her passengers and crew, a bit shaken up, but otherwise, uninjured, walked away from the wreckage. The DC-1 had never killed anybody. Neither had she ever cracked up before. Her luck ran out, that was all. Spanish Air Force mechanics were sent to Malaga to dismantle the wreck and salvage spare parts. They took what was useable and left the skeleton to die.

The story goes, according to Mike Oliveau, Douglas Company Vice-President in charge of European Operations, who has visited the site many times, that monks from the nearby Cathedral of Malaga took pieces of the metal frame and used it to fashion an Andas, a symbolic stretcher-like affair. This andas still is part of the church treasury. On church festival days it is used to carry the image of the Blessed Virgin through the streets.

Although the DC-1 died an ignominious death on the plains of Malaga in Spain, thousands of miles away from her birthplace in Santa Monica, California, she still lives on.

In the words of Don Douglas—"I see her, here and there, in the shape and design and the features which have gone into the DC-3's, DC-6's, the DC-7's and the DC-8's. Certain of these things, the DC-1 pioneered, and they will be with us as long as planes still keep their present configuration. The fact is, we would never have had the DC-8 jetliner and all the other DC-ships of the sky, if it hadn't been for the DC-1."

He might have added, that if it hadn't been for the DC-1, the traveling public probably would not be ready to accept the Jet Age. It was the "flying showcase" that put modern travel on display, and the public bought it.


The day the test crew belly-landed the DC-1!

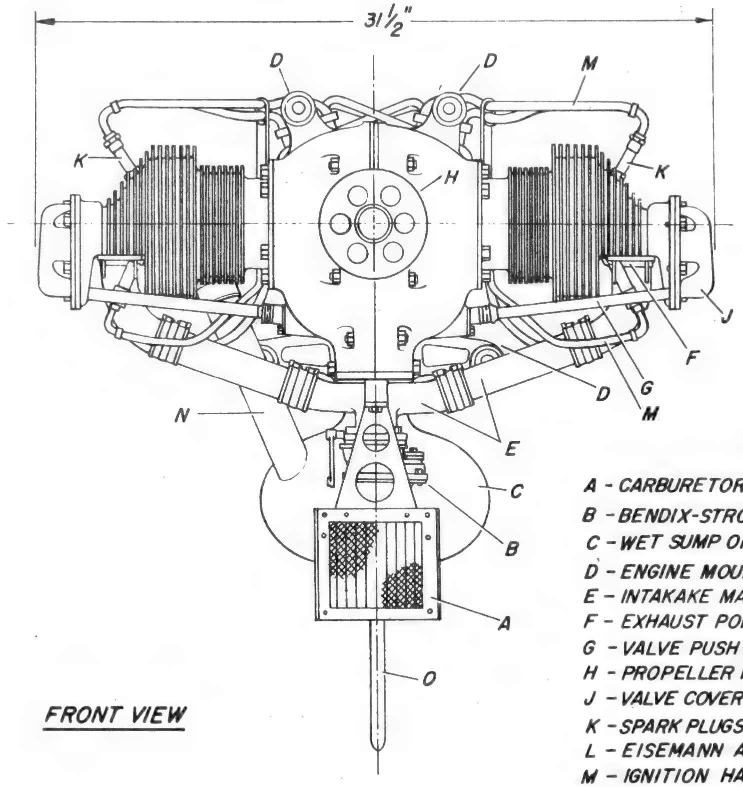
AIRCRAFT ENGINE SCRAPBOOK – 2

Continental A-65-8

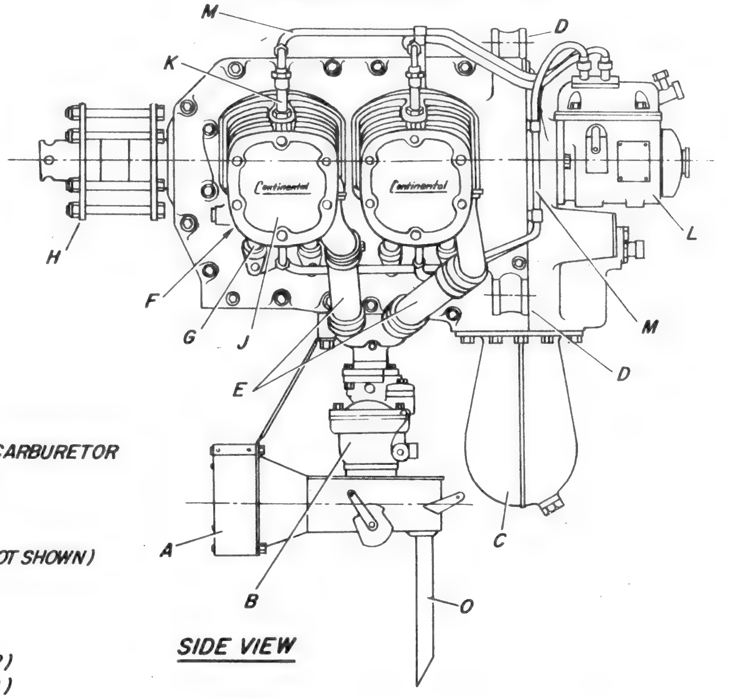
CONTINENTAL MOTORS CORPORATION
AIRCRAFT ENGINE DIVISION
MUSKEGON, MICH.

SPECIFICATIONS

HORSEPOWER – 65 (2300 R.P.M.)
TYPE – AIR COOLED, HORIZONTAL OPP.
BORE – 3.875"
STROKE – 3.625"
DISPLACEMENT – 171 CU. INCHES
NORMAL R.P.M. – 2150 (CRUISING)
COMPRESSION RATIO – 6.3:1



FRONT VIEW



SIDE VIEW

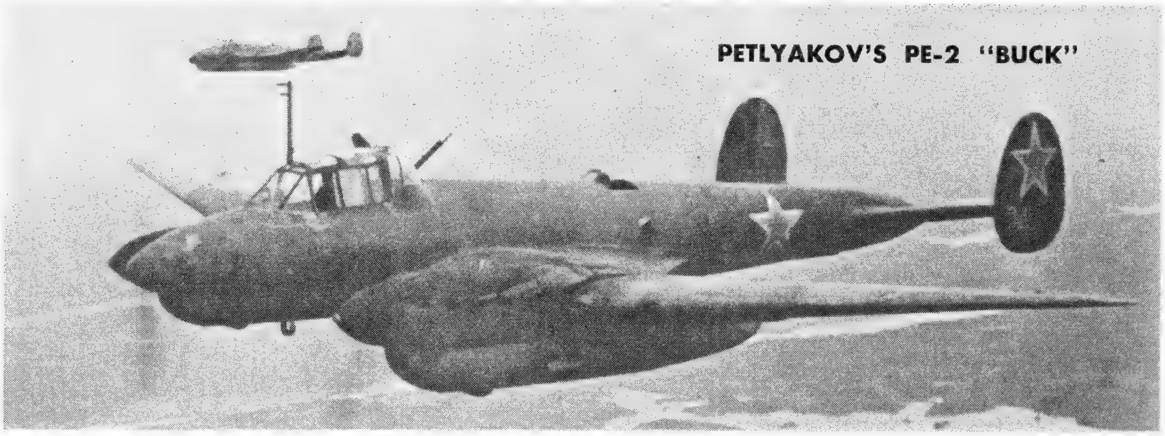
LEGEND

A - CARBURETOR AIR INTAKE
B - BENDIX-STROMBERG UPDRAFT CARBURETOR
C - WET SUMP OIL SUPPLY - 4 QTS.
D - ENGINE MOUNTS
E - INTAKAKE MANIFOLD SYSTEM
F - EXHAUST PORTS (MANIFOLDS NOT SHOWN)
G - VALVE PUSH RODS
H - PROPELLER HUB
J - VALVE COVERS
K - SPARK PLUGS (2 PER CYLINDER)
L - EISEMANN AM-4 MAGNETOS (2)
M - IGNITION HARNESS
N - OIL TANK FILLER NECK
O - VENT

SCALE IN FEET

NOTE – THE CONTINENTAL A-65, 65 HORSEPOWER ENGINE IS ONE OF THE MOST POPULAR LIGHT AIRCRAFT ENGINES EVER MADE. THIS ENGINE AND ITS 50, 75 AND 80 H.P. COUNTERPARTS – ALL VERY SIMILAR IN APPEARANCE – ARE PROBABLY BEST KNOWN FOR THEIR DEPENDABILITY AS USED IN THE MOST POPULAR PIPER AND AERONCA LIGHTPLANES (AS WELL AS MANY OTHERS) FOR OVER TWENTY YEARS.

J.W. Triggs



PETLYAKOV'S PE-2 "BUCK"

RUSSIAN BOMBERS

By Maj. George J. Geiger, USAFRes

■ Operational bombers of the Soviet Air Forces consist of an odd mixture of World War II propeller driven aircraft, post-war light jets and prop driven mediums, plus recently developed all-jet medium and heavy types. The propeller driven aircraft, being replaced with the newer jets as fast as the latter can be produced, are still used in support roles and as operational trainers.

The Soviets had to cling to World War II machines for many years—until manufacturing facilities destroyed during the war were again available to produce the jet bombers that currently comprise the tactical and strategic striking arm of the Red Air Force. The all-jet units are equipped with several of the latest light, medium and heavy bomber types; most of these could strike at the United States via in-flight refueling.

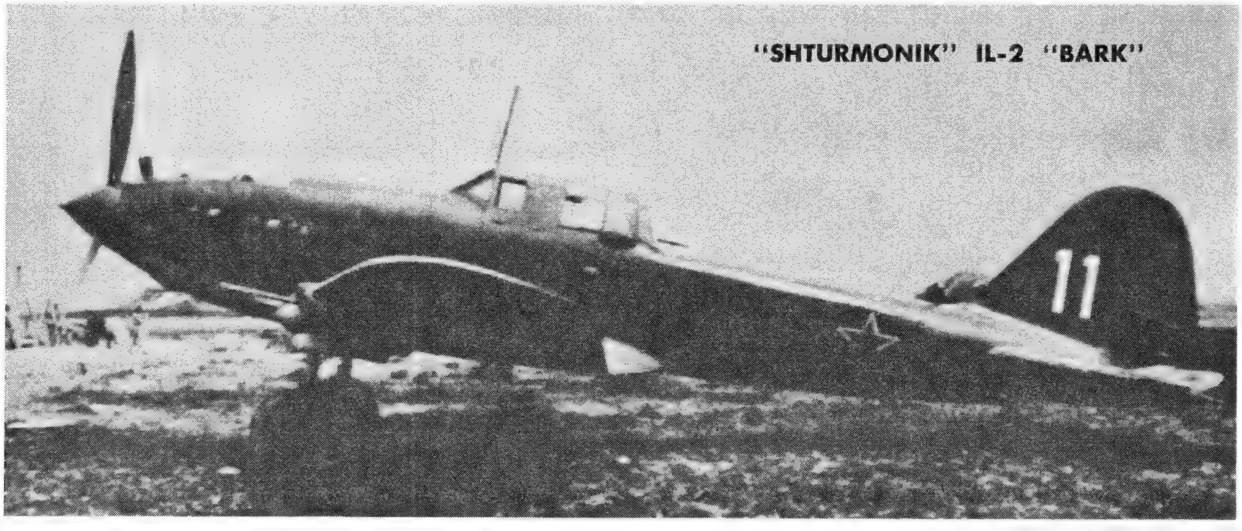
Impressed by the success of the United States in our strategic bombing campaign, the Russians in 1942 created the Long Range Flying Command (ADD) in an effort to obtain a strategic bombing program of their own. This program included all the long range bombers, mostly PE-8's, and throughout this early period the Soviets attempted to Lend Lease B-17 and B-24 bombers from the United States. The Allies turned a deaf ear to these proposals. It was not until the end of the War when several B-29's made forced landings near Vladivostok that the Reds had the chance they were waiting for.

Tupovlev was ordered to lay aside his own heavy bomber designs and concentrate on producing a copy of the B-29. Both American and British engineers consider that job of pirating and producing the TU-4 one of the outstanding feats of the Soviet Aviation industry.

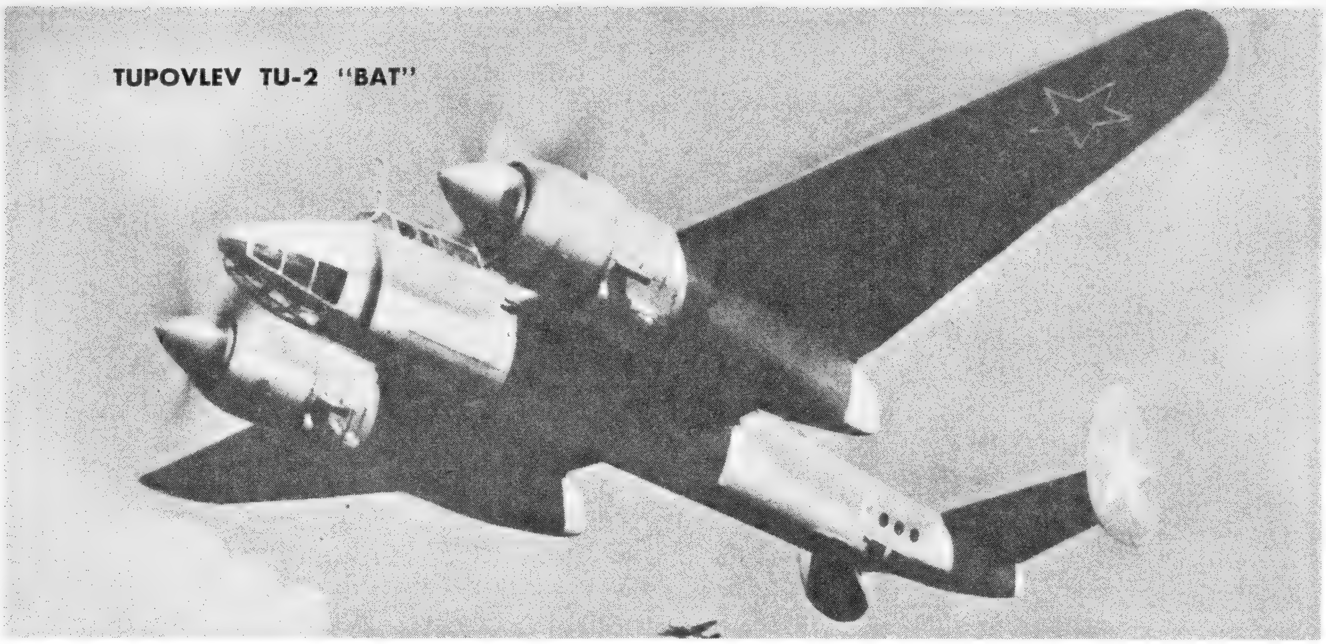
The Soviet experts on strategic bombing, stagnated at the end of the War, needed both aircraft and tactical doctrine. Their program got a big boost when Stalin visited the ruins of Berlin, and decided that this was the way future wars would be fought. Until then all the Soviets had to build a bomber force on were some old PE-8's and the TU-4. Soviet industry was committed to build an interceptor defense force from 1945 to 1950. The ADD used these years to train bomber crews in existing aircraft. The TU-4's served a good purpose and the conversion to jet bombers was relatively swift and simple.

Work on bomber design progressed even during the lean years . . . in 1946 Ilyushin produced the IL-16 four jet bomber in limited quantities. This design was a rework of the German Junkers JU-287K. In 1950 the Soviets showed off twin-jet tactical bombers in East Germany; later the same bombers were seen flying over Poland and other Satellite countries. This was the IL-28 NATO Code Name "Beagle," designed by Ilyushin. The Red Navy also unveiled a twin jet bomber by Tupovlev, the TU-14 "Bosun."

In 1951 the development of in-flight refueling equipment and techniques paid off for the ADD when the MI-13 "Barge," a four engined bomber-tanker, was delivered. At once the boys in the Kremlin got busy making plans. When in 1954 came a new four jet bomber, the "Bison," the race between the United States and Russia was on, even



"SHTURMONIK" IL-2 "BARK"



though the USAF had only about ten B-52's at this time. The Soviets use the "buddy system" of in-flight refueling. Bison and "Bear" bombers can quickly be converted into tankers with the hose and reel type refueling system. A similiar system suggested to the USAF some years back is in current use by the U.S. Navy. It is a simple set-up which makes almost all aircraft convertible into tankers in a short time, thus reducing the number of planes to be maintained. No separate tanker fleet is necessary.

The first class aircraft displayed by the Soviets lately indicate an advance in bomber design, also that the technical proficiency of their bomber crews is at its best. This line of advanced bomber design recently culminated in "Blowlamp," a light twin-jet bomber which General Twining stated is the best Soviet design seen since the War. Also entering service at this writing is the new six-jet, delta winged "Bounder," developed from the German Horton 19 "Flying Wing".

A reliable estimate of the bomber forces in the vicinity of Moscow indicates that 500 to 600 bombers are based there, mostly medium jet and heavy jet types. Another large concentration is reported near Kiev. In Northern and European Russia some 200 Bear, 200 Bison, 800 Badger and 500 Bull bombers are permanently stationed. So the total bomber strength of the Soviet Air Force has been estimated at some 5,000 tactical bombers, 2,700 light and medium jet bombers and 1,700 strategic bombers. The following are the operational types now in active service with the Soviet Air Force.

PE-2 BUCK—First flown in 1940; one of the Russian aircraft used to bomb Berlin during World War II. Designed by Vladimir M. Petlyakov who was killed in an aircraft crash in 1944, this three seat dive bomber and ground attack aircraft, the backbone of the Soviet bomber forces during WW-II, is still in active service in the Air Forces of Russia, Poland, Czechoslovakia, Bulgaria and Rumania. One version designated PE-3 is used as a long range reconnaissance fighter. A mixed lot of PE-2's and PE-3's were sent to Yugoslavia before Tito left the Red orbit.

The PE-2 is a low wing monoplane of mixed metal and wood construction, with conventional retractable landing gear and fitted with dive brakes under the wings. It is powered by two 1100 HP VK-105R inline engines and is armed with six machine guns in two different calibers. One 7.62mm Beresin machine gun is mounted in a fixed position in the nose, two 7.62mm Beresin machine guns are mounted in two fuselage barbetts. It has three 12.7mm Beresin machine guns mounted one in the ventral position and two in a dorsal turret. Provision is made for a 2000 lb bomb load—four 250 lb bombs under the wings, and four 250 lb bombs in the bomb bay.

SPAN 56ft 3in; LENGTH 41ft 6in; HEIGHT 14ft 0in; EMPTY WGT 12,914 lbs; GRS WGT 16,940 lbs; MAX SPEED 335 mph at 16,000 ft; CRUIS SPEED 285 mph; LAND SPEED 87 mph; CEILING 32,800 ft; RANGE 620 miles; MAX RANGE 932 miles.

IL-2 BARK—First seen in action in June 1941; won for its designer a Stalin Prize of 200,000 rubles. Named 'Shturmonik", it was the scourge of the German Panzers. First produced as a single seat dive bomber. Later models designated IL-2B were two seaters and mounted one 12.7mm or one 20mm gun in the rear cockpit on a swivel. Still operational in the Soviet Air Forces it is a fine ground support aircraft; large numbers have been sent to Poland, Bulgaria, Czechoslovakia, Red China and North Korea. The aircraft saw action in the Korean conflict; quite a few were captured by the UN Forces.

IL-2 is a low wing monocoque type of mixed construction, mostly metal. Retractable main landing gear, semi-retractable tail wheel. AM-38 1300 HP inline engine on the prototype drove a constant speed three bladed metal propeller. Later models have the AM-38F of 1700 HP mounted. Heavily armored with plate up to 6mm thickness; armed with two 7.62mm ShKASS machine guns and two 20mm ShVAK cannon in the wings. Some models mount two 57mm cannon for tank busting. A bomb load of 1323 lbs may be carried, or four 56-lb RS-132 rockets may be mounted under the wings.

SPAN 47ft 11in; LENGTH 38ft 2-¾in; HEIGHT 10ft 9in; GRS WGT 12,257 lbs; MAX SPEED 283 mph at 13,130 ft; CEILING 21,325 ft; RANGE 373 miles at 183 mph; MAX RANGE 620 miles.

TU-2 BAT—This design earned for Tupovlev a Stalin Prize in 1943. Was first seen in limited squadron service in 1944-45, used to fill gap between the PE-2 and the IL-4. It is still operational as an attack bomber, tactical trainer, and high and low level bomber. Fitted with a radar nose it is used as an all-weather fighter, also for tow target work. One version has two 30mm cannon and two 20mm cannon in the nose for ground support work. Some, reworked and furnished with two RD-10 (Junkers JUMO 004B) turbo-jets, designated TU-8, were the first Soviet jet bombers to fly. Some equipped with turbo-superchargers and four bladed propellers, designated TU-6, used for high altitude reconnaissance.

Of conventional construction, all metal with fully retractable landing gear, powered by two ASh-82FNV radial engines of 1850 HP each. Normal forward armament is two 20mm ShVAK cannon in the wing roots; three 12.7mm Beresin machine guns mount in two positions for rearward defense—all with limited radius of fire. A maximum bomb load of 5000 lbs may be carried, internally and under the wings. None of these TU-2 bombers have been passed out to the Satellite Air Forces.

SPAN 61ft 1in; LENGTH 45ft 3in; HEIGHT 15ft 8in; EMPTY WGT 18,240 lbs; GRS WGT 28,244 lbs; MAX SPEED 345 mph at 19,000 ft; CRUIS SPEED 275 mph at 19,000 ft; CEILING 33,000 ft; RANGE 880 miles with 5000 lbs bombs; MAX RANGE 1550 miles with 330 lbs bombs.

IL-10 BEAST—Appeared in late 1944 as a replacement for the IL-2; it also won a Stalin Prize for the designer, Ilyushin. The main difference between the two seats IL-2B and the IL-10 is the tapered leading edge of the wings on the Beast. A few IL-10's were captured by the UN Forces in Korea. Until late 1950 it was in production at Kulbyshev Plant No. 1; over 4,000 were built. This aircraft forms the backbone of the ground support units in both the Soviet and Satellite Air Forces. It has been distributed to Hungary, Poland, North Korea, East Germany, and Red China.

Of mixed wood-metal construction but mostly of metal with fabric covered control surfaces. The landing gear is similar to the IL-2 but with a semi-retractable tail wheel. Equipped with a LCE-6 VHF radio, capable of carrying a fuel load of 194 US Gallons; aircraft is powered by a single 2000 HP Mikuline AM-42 12 cylinder, liquid cooled, in-line engine. Armored with plate which varies in thickness from 6mm to 8mm, with the rear gunner protected by 13mm armour plate. For armament the aircraft mounts two 7.62mm Beresin machine guns in the cowling, two 23mm VYa cannon in the wings, and one 12.7mm Beresin machine gun or one 20mm ShVAK cannon in a flexible mount in the rear canopy. A bomb load of 2200 lbs may be carried and some have been observed with four 56-lb RS-32 or two 132mm rockets under the wings.

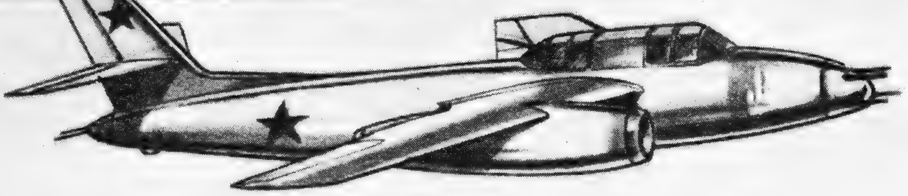
SPAN 45ft 6in; LENGTH 40ft 4in; HEIGHT 13ft 6in; GRS WGT 14,000 lbs; MAX SPEED 283 mph at 7,000 ft; CRUIS SPEED 210 mph; CEILING 21,325 ft; RANGE 773 miles; MAX RANGE 1671 miles.

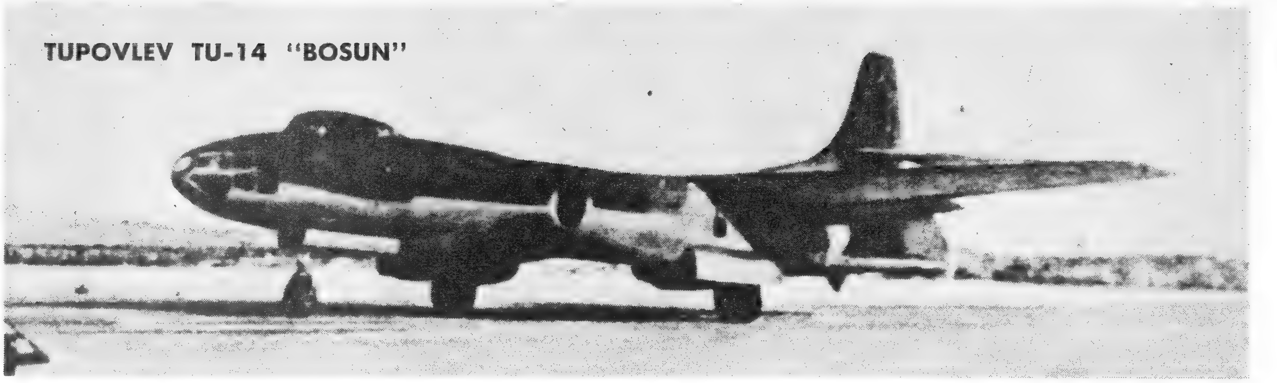
TU-10 BRAWNY—This Tupovlev designed twin jet attack bomber is the successor to the IL-2 and IL-10 ground attack bombers of World War II fame. The aircraft is in service with both the Red Air Force and the Red Navy (NATO Code Name "Frosty"). First seen in 1949. The basic design has since been developed into the twin jet light naval bomber TU-14 Bosun. The construction is of conventional all metal with 30° swept wings and tail surfaces. Originally it was powered by two TM-7 turbo-jet engines of 4,800 lbs thrust designed by Tumansky with German help during 1946-47. Later version of this aircraft mount larger engines of unknown thrust. For armament this aircraft carries four 20mm ShVAK cannon in the nose, two 20mm cannon in a radar sighted tail turret, and one 12.7mm Beresin machine gun in the rear of the greenhouse type enclosure. Rockets or small bombs are usually carried under the wings; the naval version can mount a torpedo under the fuselage. Information on this aircraft is

Left: ILYUSHIN IL-10 "BEAST"

Center: TUPOVLEV TU-10 "BRAWNY"

Bottom: ILYUSHIN IL-4 "BOB"




TUPOVLEV TU-14 "BOSUN"

scanty but it is known to be used widely within the Soviet Union and is replacing other attack types.

SPAN 49ft 3in; LENGTH 42ft 6in; GRS WGT 30,000 lbs; MAX SPEED 515 mph.

IL-4 BOB—The first Russian bomber to bomb Berlin during World War II. Before 1941 the IL-4 was designated DB-3F; over 200 per month were produced during the period 1942-45. Many modified as torpedo bombers for the Red Navy are in active service for coastal reconnaissance. The Soviet Air Force uses this aircraft as a light bomber and crew trainer and as such many have been sent to the Red Chinese and Polish Air Forces. Yugoslavia got a batch of IL-4's before defecting from the Red orbit. The TSKB-26 twin engined transport designed by Ilyushin in 1939 was the forerunner of the IL-4.

All metal monocoque construction, powered by two M-88B radial engines of 1100 HP each. For armament there are three flexible mounted 7.62mm Beresin machine guns in three positions—nose, dorsal turret, and under the aft portion of the fuselage. The Naval version can carry one 18 inch naval torpedo and one 2200-lb sea mine. The Red Air Force version has a maximum bomb load of 7700 lbs, carried both internally and mounted under the wings.

SPAN 70ft 2-¾in; LENGTH 48ft 6-¾in; GRS WGT (Normal) 17,044 lbs; GRS WGT (Maximum) 22,105 lbs; MAX SPEED 277 mph at normal weight; CRUIS SPEED 199 mph; CEILING 32,810 ft at normal weight; RANGE 1616 miles with 2204 lbs bombs; MAX RANGE 1988 miles at normal weight.

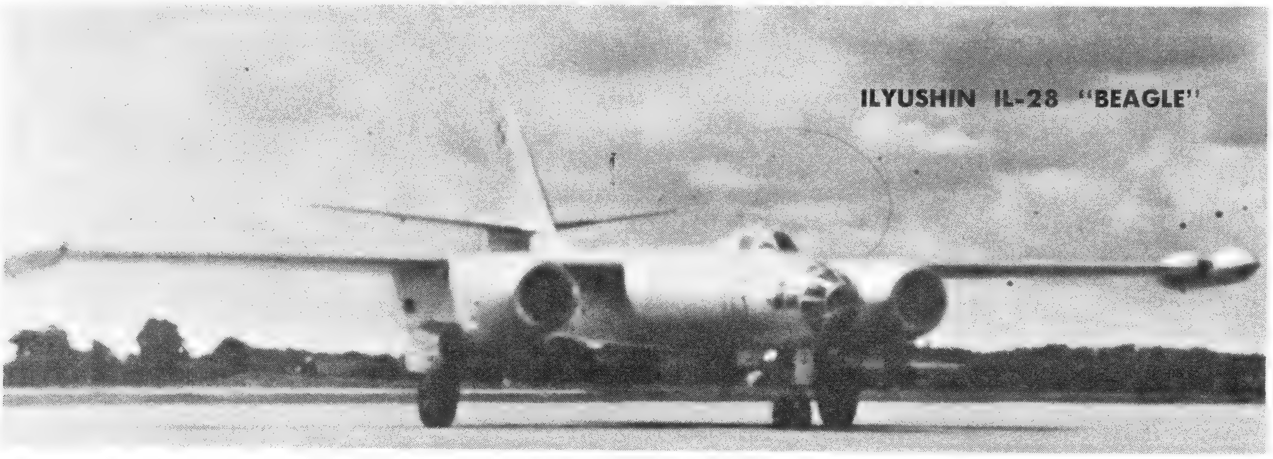
TU-14 BOSUN—A twin jet, Tupovlev designed Naval torpedo bomber, developed from the TU-10 Brawny of 1948—but has a radome mounted under the nose section, a blunt tail, fin extension, and a sloping trailing edge to the rudder. Carries a crew of three: pilot, bomb-aimer, and tail gunner. First seen in quantity during the 1951 Moscow Air Show when it appeared painted Red Navy gray. Used mainly for torpedo bombing and patrol duties. Has been observed in Squadron service during 1952 in Manchuria, and is manufactured in Eastern Siberia at Komosomolsk-nad-Amur. Several Squadrons of TU-14's are in service with the Red Chinese Navy.

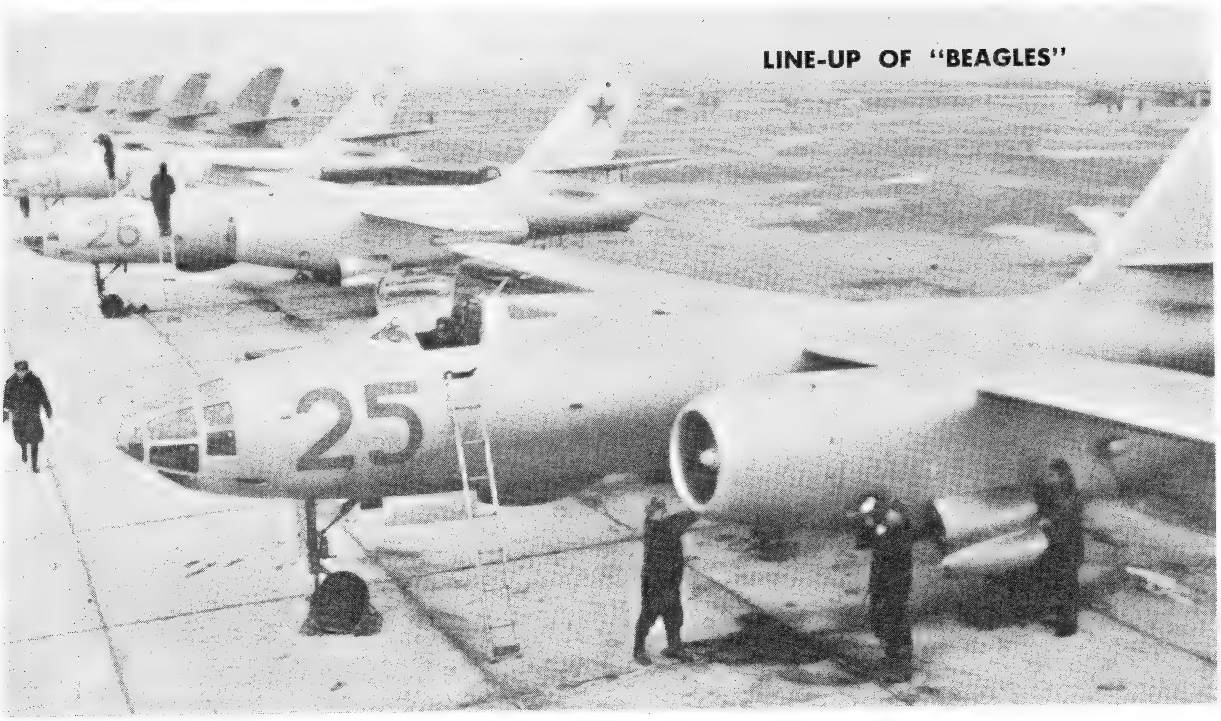
The TU-14 is of all metal construction with a monocoque fuselage, underslung engine nacelles and retractable tricycle landing gear. It is equipped with a Soviet copy of the USAF APQ-23 radar set which fell into Russian hands via interned B-29's during World War II. The prototype was powered by two VK-2R turbo-jet engines of 7,700 lbs thrust each, but subsequent modifications include the mounting of larger M-012 engines of about 9100 lbs thrust. Armament is two fixed 23mm VYa cannon in the nose and two 12.7mm Beresin machine guns in the tail turret. A bomb load of 6000 lbs may be carried. The Red Navy has some 450 TU-14's in active service; its replacement may be a modified YAK-42, fitted to launch air-to-surface missiles.

SPAN 70ft 0in; LENGTH 65ft 0in; Height 12ft 0in; GRS WGT 50,000 lbs; MAX SPEED 620 mph; CRUIS SPEED 485 mph; CEILING 30,000 ft; RANGE 2175 miles; MAX RANGE 3000 miles at 325 mph.

IL-28 BEAGLE—An Ilyushin designed twin jet light bomber and close support type aircraft. During the Korean Conflict the UN Forces feared that this bomber would be used by the Red Chinese. First observed on May Day 1950, when a formation of 60 aircraft flew over Red Square in Moscow. Now based in East Germany and Poland in Red Air Force Units; some squadrons in the Polish Air Force have been operationally equipped with this aircraft since 1953. A small number were sent to Rumania in 1955, some 50 were sold to the Egyptian Air Forces in 1955-56. Produced in State Factories in Czechoslovakia, and in addition manufacturing rights to the IL-28 have been granted to Poland and Red China. Some 3000 aircraft of this type have been built in Russia since 1956. The Soviet Air Force also uses this aircraft as a night fighter (with additional armament) and as a crew trainer (designated IL-28U).

Construction is all metal, with retractable tricycle landing gear. Some models have been equipped with wing-tip tanks for extended range. Without tip-tanks total internal fuel load is 2630 US gallons. Powered by two RD-45F or VK-1 turbo-jet engines of 5000 lbs thrust each. Armament


ILYUSHIN IL-28 "BEAGLE"



LINE-UP OF "BEAGLES"

is two 23mm VYa cannon mounted in the nose serviced with 150 rounds per gun and two 12.7mm Beresin machine guns mounted in a tail turret. The IL-28 is equipped with a German designed synchronis optical bomb sight with an altitude limitation of 49,200 feet. A bomb load of 3000 lbs or one small tactical type atomic bomb may be carried.

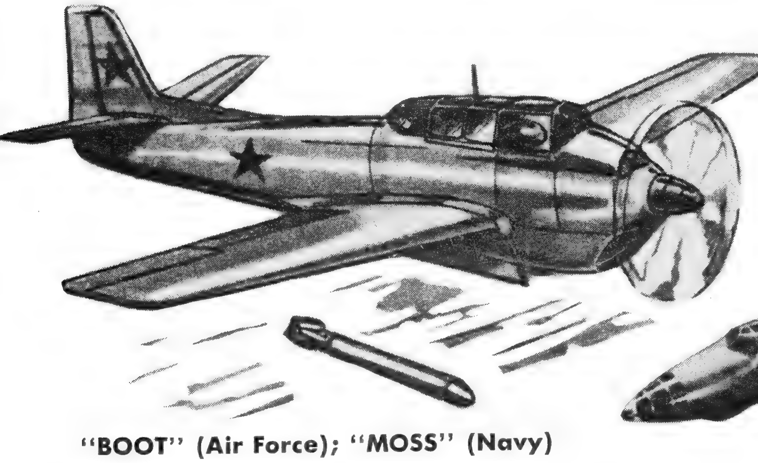
SPAN 68ft 0in; LENGTH 62ft 0in; HEIGHT 22ft 0in; GRS WGT 38,500 lbs; MAX SPEED 610 mph; CRUIS SPEED 470 mph; LAND SPEED 100 mph; CEILING 45,000 ft; RANGE 600 miles; MAX RANGE 994 miles.

TU-? BOOT—This new turbo-prop driven aircraft for light bombardment (in the Soviet Air Force) and torpedo bombing (in the Red Navy) has been credited to a Tupovlev design group. First observed in 1956 near the Kubinka Naval Station. Similar in appearance to the British Fairey Gannet; has been seen flying over Moscow many times since February 1957. The Naval version, NATO Code Name "Moss," carries the torpedo internally, The Red Air Force version carries bombs both under the wings and in the bomb bay. Some reports have rockets mounted under the wings.

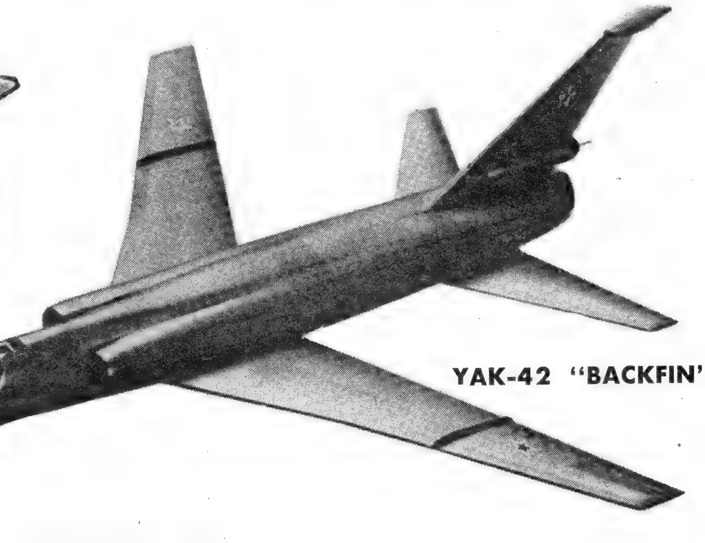
Of conventional all-metal construction with retractable main landing gear and a retractable tail wheel. Naval models have been observed with arresting gear indicating possible carrier use. Powered by a single NK-4 turbo-prop engine of 4000 SHP rating driving four bladed contra-rotating propellers (this is the same engine used on the AN-10 transport). For armament Boot mounts two 20mm ShVAK cannon in the wings, two 12.7mm Beresin machine guns in a flexible rearward firing mount. One torpedo or 2400 lbs of bombs may be carried. Provisions are also made for minelaying duties. Specifications at this writing unknown, but a MAX SPEED of 335 mph has been released.

YAK-42 BACKFIN—A high performance, light transonic bomber, designed by Yakovlev. Latest Soviet aircraft of this type to appear, first spotted in early 1958. Since seen in the air over Moscow indicating that it was flight tested at the major Red Air Force development center at Ramenskoye. First flown sometime during late 1956. Carries a three man crew: pilot, navigator-bombardier, and radio-gunner. Placed in series production in early 1959, some are already in active service with units of the Soviet Air Force. The Red Navy will also get some modified versions for reconnaissance and air-to-surface missiles directed against shipping.

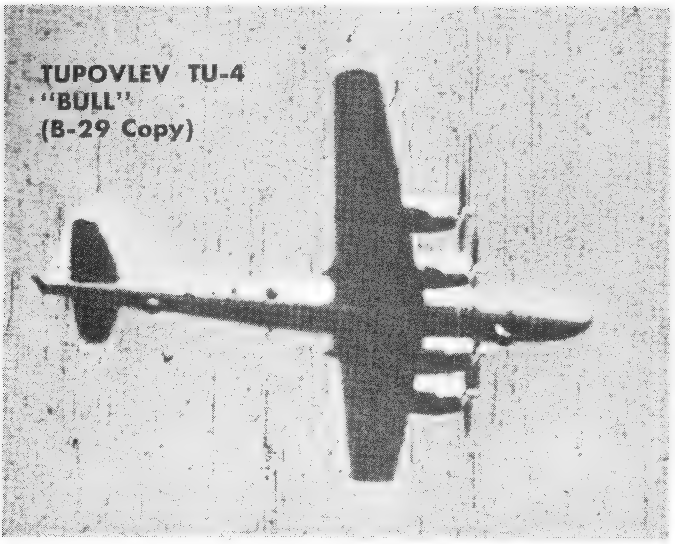
Of all-metal construction with low mounted wing, swept back 60° in the inner third and 46° in the outer portion. Powered by two fuselage-mounted M-209 gas turbine engines rated at 26,400 lbs thrust each with afterburner. Can reach Mach 1.0 on one engine. Provisions have been permanently installed for jet assist or rocket assisted take-offs. Armament consists of one 30mm Mauser 213/C cannon in fixed position on right side of nose, two 23mm VYa cannon in radar sighted tail stinger, with some reports of a single 37mm cannon mounted in this position. Six 105mm air-to-ground rockets or two Komet-D missiles



"BOOT" (Air Force); "MOSS" (Navy)



YAK-42 "BACKFIN"


TUPOVLEV TU-4 "BULL" (B-29 Copy)

may be carried. Total bomb load of 11,000 lbs or two tactical atomic bombs carried internally.

SPAN 80ft 5in; LENGTH 101ft 9in; HEIGHT 26ft 6in; EMPTY WGT 48,400 lbs.; GRS WGT 88,660 lbs; LANDIN WGT 55,000 lbs; MAX SPD 1000 mph at 50,000′, 975 mph at 40,000 ft and 838 mph at sea level; LAND SPEED 133 mph; CEILING 50,500 ft; RANGE 1500 miles.

TU-4 BULL—During World War II several B-29's landed at Khabarovsk and Vladivostock in Siberia and were interned by the Soviets. Result of this was the "Chinese copy" designed by Tupovlev. Since being placed on active service the TU-4 has been the backbone of the ADD. Many crews now flying the later jet bombers were trained in this aircraft. Over 1200 TU-4's have been built since 1946, most are still in operational use. About 400 TU-4's were sent to Red China in June 1951, one squadron is based in Hungary to train Hungarian Air Force bomber crews. Many TU-4's have been modified as tankers with hose and reel type system to refuel fighters. From the TU-4, Tupovlev evolved the TU-70 "Cart," a 72 seat pressurized transport which was not too successful but is still in use in some numbers.

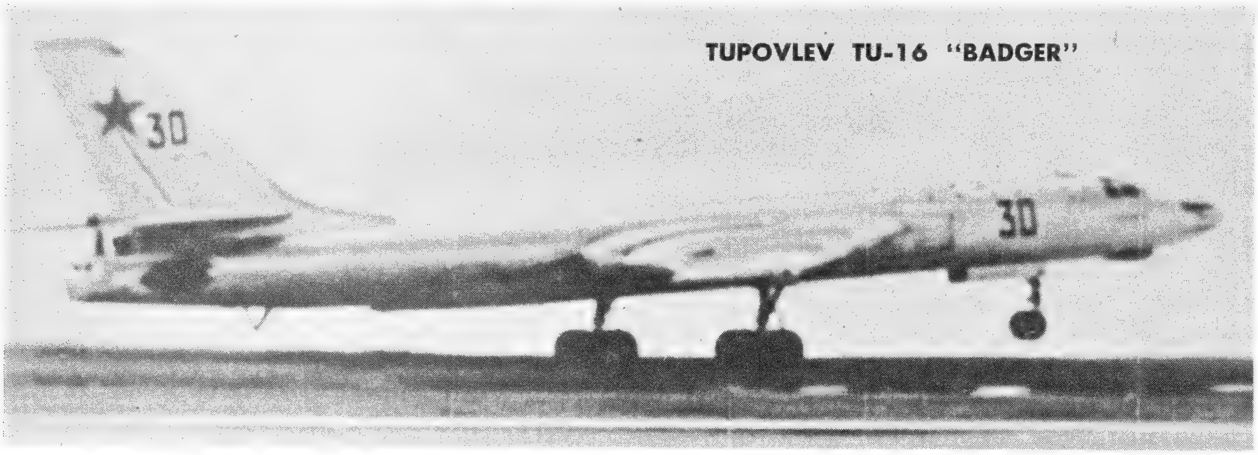
The construction is typical all-metal World War II type with a monocoque fuselage, single fin and rudder, double-tire retractable tricycle landing gear. Power is supplied by four ASh-73TK radial engines of 2000 HP each. Armed with ten 12.7mm Beresin machine guns mounted two each in five remote controlled turrets. The fire control set-up is a steal from the General Electric system in the B-29. A German LOTFE 7 type optical bombsight is installed; a bomb load of 9900 lbs of bombs including atomic weapons can be carried.

SPAN 141ft 4in; LENGTH 99ft 0in; HEIGHT 30ft 0in; GRS WGT 104,720 lbs; MAX SPEED 358 mph; CRUIS SPEED 250 mph; LAND SPEED 100 mph; CEILING 44,128 ft; RANGE 2330 miles; MAX RANGE 2600 miles.

TU-16 BADGER—With the aid of German designer B.C. Baade (who worked on the EF-125 bomber during WW II for the German Luftwaffe) Tupovlev has designed a twin jet medium bomber that can hit any target in Europe, Asia or North Africa. It made its first public appearance on 1 May 1954 at the May Day celebration and in July 1955, 54 were seen flying in formation over Moscow. Similar in performance to the USAF B-47 it is powered by two Mikuline designed AM-3 twin spool turbo-jet engines rated at 18,400 lbs thrust each.

The TU-16 is a mid-wing all metal cantilever monoplane with a slight negative dihedral and 35° swept wings. Standard landing gear retracts into special pods which project beyond the trailing edge of the wings. Armed with one 30mm Mauser 213/C cannon mounted in fixed position on right side of nose and six 20mm ShVAK cannon two each in three remote controlled power operated turrets at the tail, belly and top positions. A bomb load of 9988 lbs or an atomic bomb can be carried in the bomb bay. There are reports of a Komet-D air-to-surface missile mounted in a special rack under the fuselage. The TU-16 is in production in Eastern Siberia at a Kuibyshev plant. Production had been fixed at 40 to 50 units per month. There are approximately 750 in active service with 150 in reserve. Some sources indicate that production has stopped in favor of the new six jet Bounder bomber. Tupovlev used this design to produce the TU-104 twin jet transport, Aero-Flot standard for world air routes.

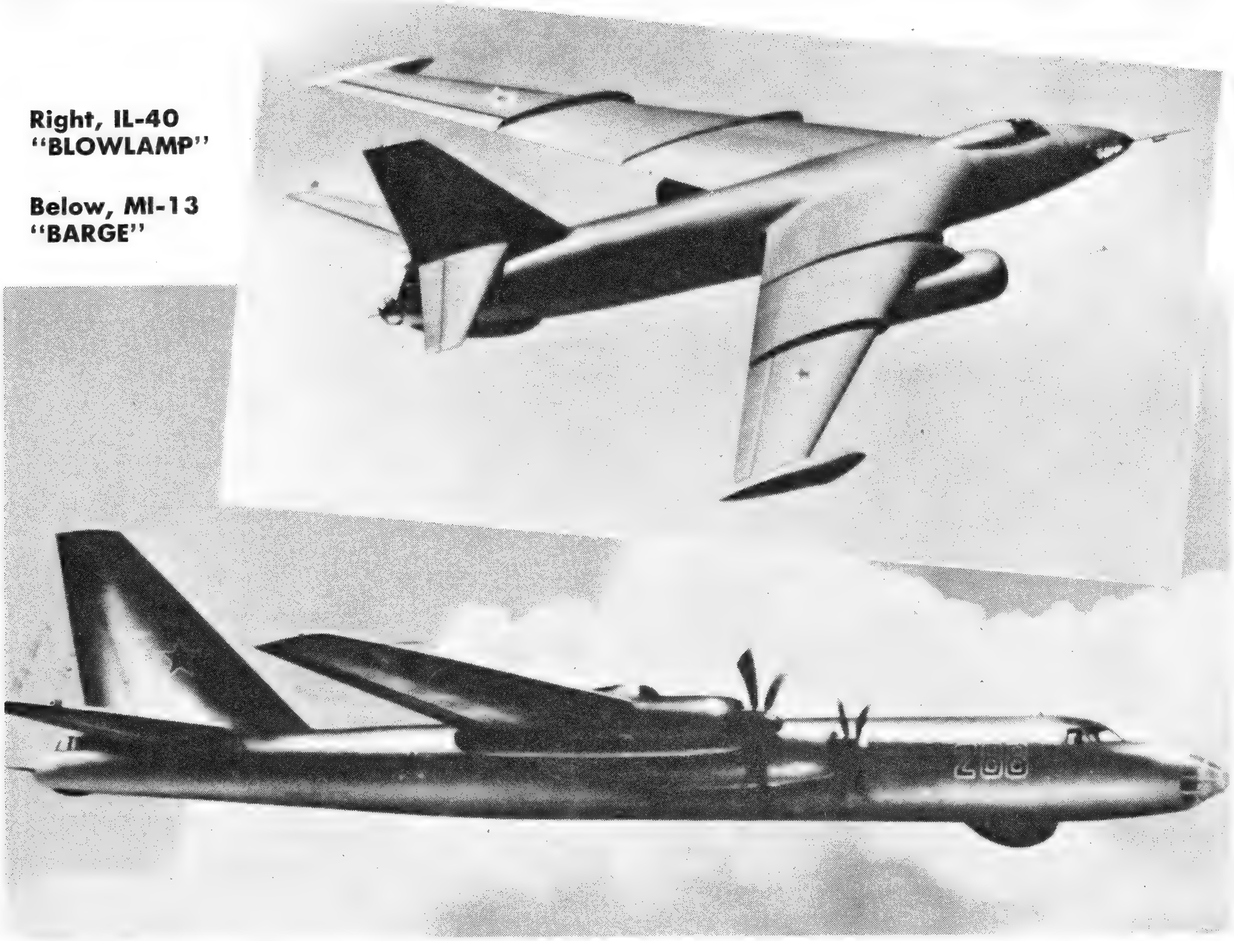
SPAN 116ft 2in; LENGTH 109 ft 10in; GRS WGT 150,400 lbs; MAX SPEED 610 mph; CRUIS SPEED 545 mph; CEILING 43,996 ft; RANGE 3105 miles; MAX RANGE 4350 miles; COMBAT RADIUS 1972 miles.


TUPOVLEV TU-16 "BADGER"

IL-40 BLOWLAMP—This Ilyushin designed twin jet light/medium bomber, first seen in quantity in September 1957 when a formation of 36 flew over Moscow, is to be the replacement for the IL-28 Beagle bomber. First shown to Western observers at Tushino Aerodrome in 1958. Placed in series production in early 1957 it is now entering active service in great numbers. Is in same class as USAF Douglas B-66 with speed close to Mach 1.5 at altitude. Of all metal monocoque construction with shoulder mounted 55° swept wings and tail surfaces. Underslung pod-mounted Lulkov-designed turbo-jet engines that powered the prototype developed 11,400 lbs thrust each. Later production models mount the MR-40 turbo-jet with afterburners rated at 17,100 lbs thrust each. Utilizes tandem design landing gear with outrigger wheels housed in pods at wing tips. In addition to 17,600 lb bomb load, including several tactical type atomic weapons, it is reported to carry latest radar gear, and fourth crew member to operate it. Normal four man crew consists of pilot, radio-bombardier, radar-navigator, tail gunner. Armament is two 30mm Mauser 213/C

Right, IL-40 "BLOWLAMP"

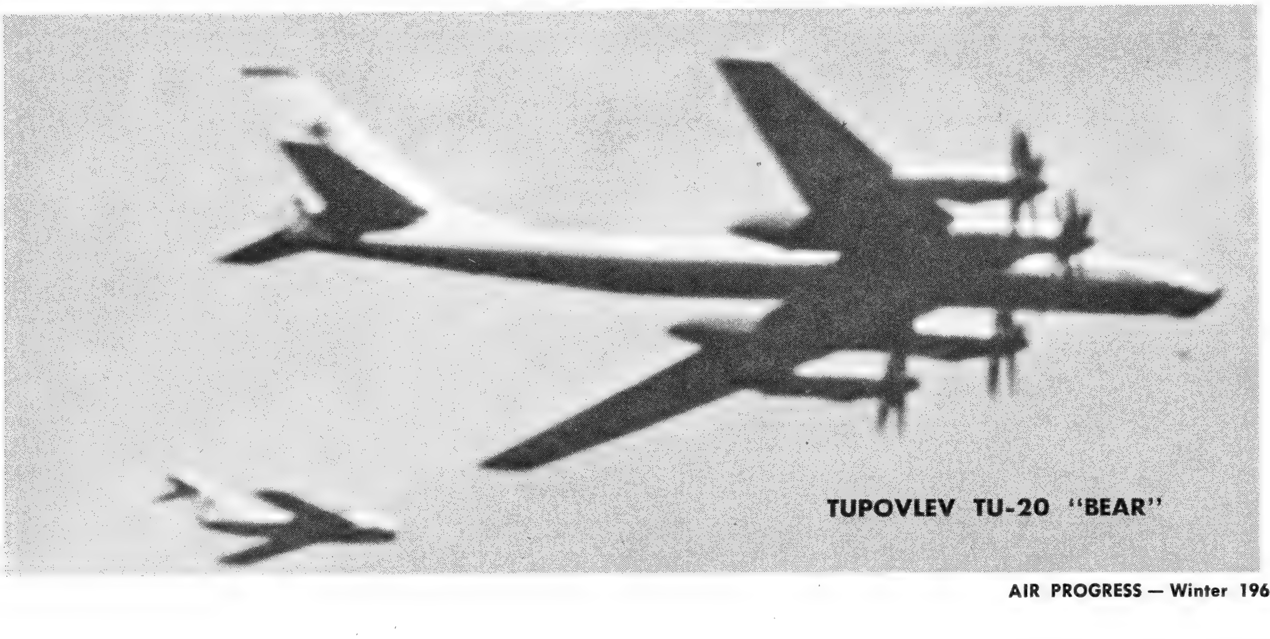
Below, MI-13 "BARGE"



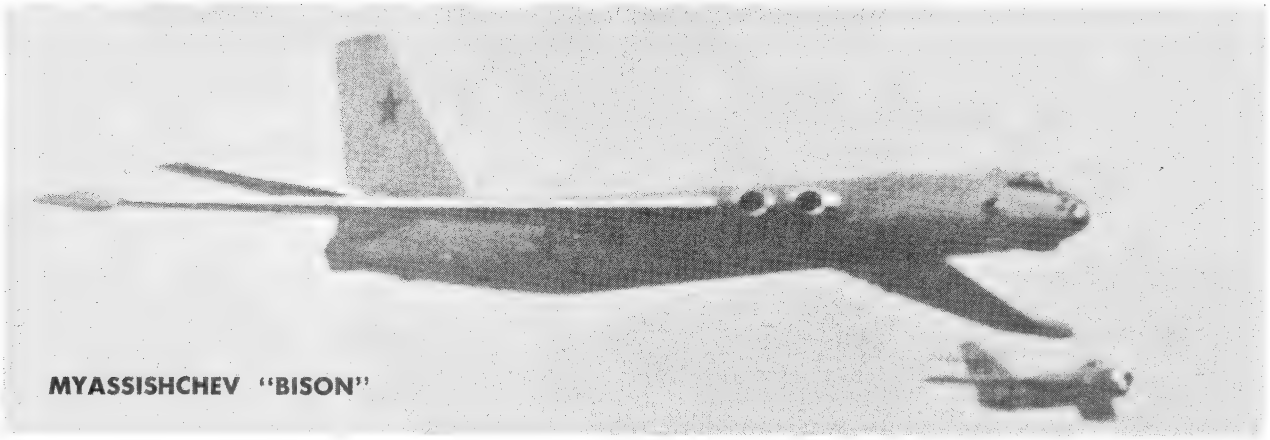
cannon in fixed position in nose and two 23mm VYa cannon in tail turret.

SPAN 65ft 6in; LENGTH 75ft 4in; HEIGHT 24ft 6in; EMPTY WGT 54,560 lbs; GRS WGT 116,600 lbs; MAX SPEED 670 mph; CRUIS SPEED 500 mph; LAND SPEED 127-132 mph; NORMAL CEILING 36,000 ft; MAX CEILING 55,900 ft; RANGE 2250 miles.

MI-13 BARGE—First observed at Soviet Air Show in late 1951, designed by M. V. Myassishchev, a member of Ilyushin's team, who later did the Bison four-jet bomber. Has many features of the TU-4. Some experimental versions seen mount two RD-45F jet engines in under-wing pods. These were mistakenly identified as the non-existent TUG-75. The MI-13 is produced in three versions: heavy bomber, long range reconnaissance aircraft and tanker (sub-divided into the MI-13 bomber-tanker and the MI-13D reconnaissance aircraft). The "13" has four Junkers Jumo M-022 turbo-prop engines of 5000 SHP each; MI-13D uses four Junkers M-224 diesel engines of 3000 HP each. Both these engines were collected as war booty by the Soviets. The tanker version is fitted with a hose and reel, probe-and-drogue refueling device as the Russians do not place too much stock in the USAF "boom" method (which requires great precision in formation flying). Equipped with extensive radar equipment and armed with an unknown number of retractable turrets mounting two 23mm cannon in each one. The bomber version can carry a bomb load of 14,850 lbs of bombs.



TUPOVLEV TU-20 "BEAR"



MYASSISHCHEV "BISON"

SPAN 180 ft 0in; LENGTH 145 ft 0in; HEIGHT 36ft 6in; EMPTY WGT 66,000 lbs; GRS WGT 189,660 lbs; MAX SPEED 485 mph at 30,000 ft; CRUIS SPEED 415 mph at 30,000 ft; CEILING 36,000 ft; RANGE 6460 MAX RANGE (Tanker version) 8880 miles.

TU-20 BEAR—An excellent bomber design by Tupovlev which can strike at any target in the United States via single in-flight refueling. Also used as a tanker to refuel jet bombers with hose and reel type device. First public showing was on 3 July 1955 when seven TU-20's flew in formation at Tushino Aerodrome in Moscow. More than 500 have been placed on active duty. A transport version TU-114D (NATO Code Name Cleet) has been developed for Aero-Flot. Four NK-12 turbo-prop engines of 12,000 SHP each drive twin four-bladed contra-rotating propellers. Each engine also supplies some 2650 lbs of residual thrust. They were designed by the German engineer Dr. Bradner. For armament six 2mm ShVAK cannon mount two each in three turrets, upper, lower and tail, plus one 30mm Mauser 213/C fixed cannon on right side of nose. The TU-20 uses a copy of the General Electric fire control system confiscated from the B-29's; these cannon have a rate of fire of 800 to 1200 rounds per minute. A bomb load of 20,000 lbs or two atomic weapons can be carried in the large bomb bay. The TU-20 represented the first step in the new concept of bombardment aviation in the Red Air Force. With the addition of the Bison and the newer Bounder bomber the USSR now has an excellent long range striking force.

SPAN 177ft 1in; LENGTH 154ft 1½in; EMPTY WGT 184,000 lbs; GRS WGT 340,000 lbs; MAX SPEED 640 mph; CRUIS SPEED 550 to 570 mph; DESIGN CEILING 36,100 ft; MAX CEILING 50,000 ft; MAX RANGE 8000 miles at 350 mph.

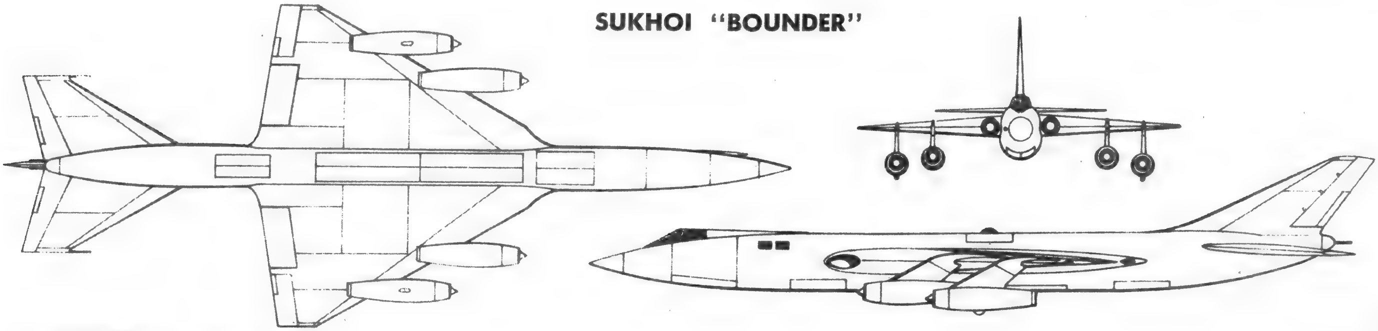
MI-? BISON—A four jet heavy bomber designed by Myassishchev (no, not Tupovlev), first exhibited on May Day 1954 flying over Moscow. The Bison is the Soviet answer to the USAF B-52 for intercontinental missions. Four Mikuline designed 19,460 pound thrust turbo-jet engines have the same power rating as the eight engines on the B-52. It can be refueled in mid-air by the TU-20 Bear tanker via probe-and-drogue method. At Red Air Show on 30 June 1957 observers saw one Bison refueling another. With two in-flight refuelings the effective range is about 8800 miles carrying a load of 19,976 lbs. The Soviets have about 480 BISON's in active service. Bicycle type landing gear, with two main boogies retracting into the fuselage at both ends of the bomb bay; two small outrigger wheels housed in pods at each wing tip. The aircraft is equipped with radar gear for navigation and bombing, and a radar sighting and firing system for the tail gunner. For armament it has four power operated, remotely controlled turrets—top, lower forward, lower aft, and tail—each mounting two 20mm ShVAK cannon. A fixed 30mm Mauser 213/C cannon is on the right side of the nose. The normal bomb load is 9988 lbs, but a maximum of 19,976 lbs can be carried.

SPAN 170ft 2in; LENGTH 158ft 10in; GRS WGT 364,430 lbs; MAX SPEED 610 mph; CRUIS SPEED 545 mph; CEILING 57,000 ft; RANGE 8800 miles.

SU-? BOUNDER—The Soviet Air Force is being equipped with a new advanced all-jet medium bomber capable of flying at twice the speed of sound. This aircraft by Pavel Sukhoi is his first bomber design. The Bounder, intended as a replacement for the TU-16 Badger bomber, is being placed in series production. Powered by six AM-3 turbojet engines of 26,400 lbs thrust each with afterburners, mounted two in the large roots of the delta wing, and four suspended in pods under the wing. A mid-wing design which features a complete tail unit. About the same class and weight category as the USAF B-58 Hustler. It has dual purpose radar for all-weather capability and smelling out ground targets. The pressurized cockpit has four crew members: pilot, co-pilot, radar-navigator, radio-gunner. Armament is restricted to two cannon in a radar controlled tail turret, triggered through a friend-or-foe recognition device. The leading edge of the wing, swept back 60°, features Fowler type flaps. The ailerons also lower for landing and act as slotted flaps. An additional flap extends under the entire width of the nose to provide an additional 20% lift. Has excellent take-off capability, can operate from grass or sod covered fields.

SPAN 75ft 0in; LENGTH 200ft 0in; GRS WGT 250,000 lbs; LANDING WGT 200,000 lbs limitation; MAX SPEED 1320 mph at 59,000 ft; LAND SPEED 135 mph; TAKE-OFF SPEED 175 mph; CEILING over 59,000 ft; RANGE 1650 miles which can be extended by in-flight refueling.

SUKHOI "BOUNDER"



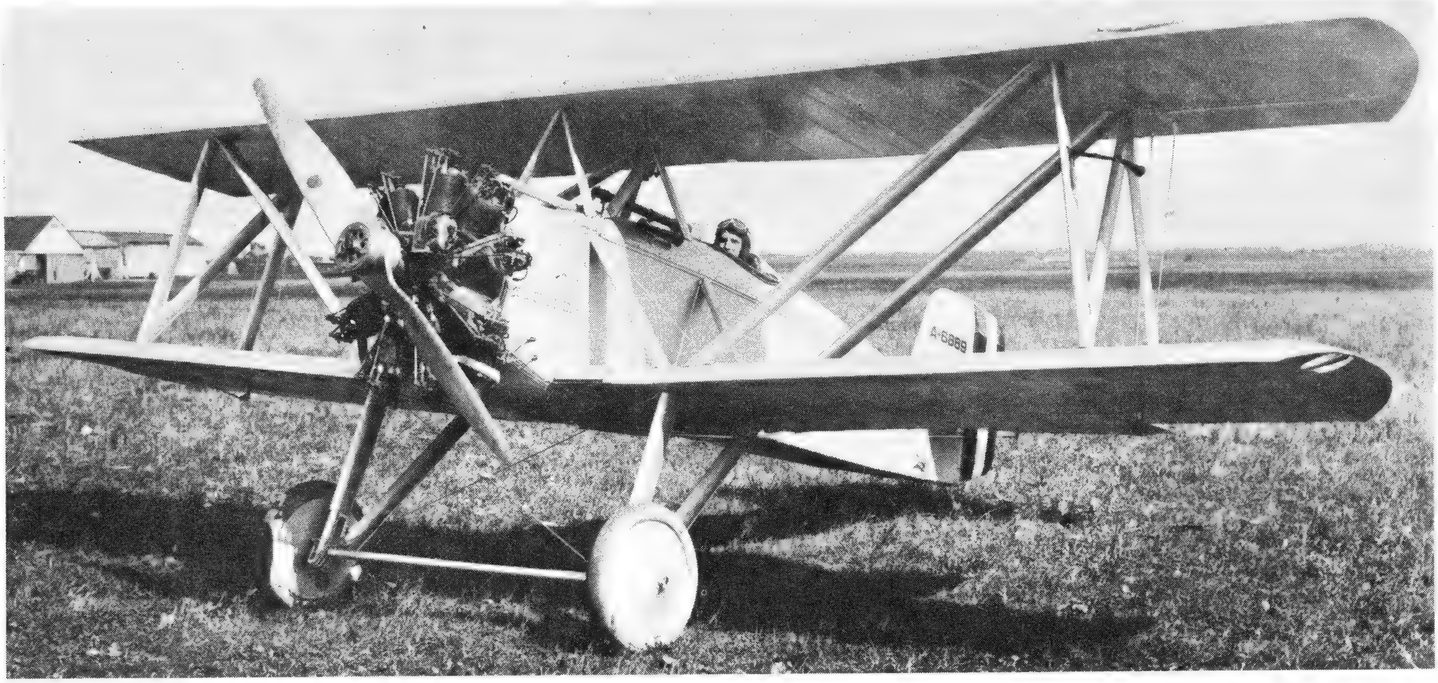
FORGOTTEN FIGHTERS

PART TWO...NAVY PROTOTYPES BETWEEN THE WARS

Compiled by Peter M. Bowers

The first part of this series which appeared in the Fall, 1958, issue of *Air Progress* described the lesser-known "Production" fighters built in quantities greater than ten for the Army and the Navy.

This installment deals exclusively with experimental Navy prototypes built between the two World Wars which were not followed with orders for production models. In most cases, only one airplane of each model was built although a few "doubles" do appear. Each is presented in order of purchase by Navy serial number. This must not be considered as an infallable guide to the sequence of airplane appearance, however, as company-owned airplanes were frequently tested by the services under "bailment" contracts for a considerable period before actually being purchased. Standard type designations were sometimes applied to aircraft on bailment test, but a Navy serial num-



CURTISS-HALL F4C-1 (6689, 6690) of 1925 was the first Curtiss fighter built under the new Navy designating system that combined type, sequence of design, and manufacturer. But it was not called FC-1 because of the existence of earlier Curtiss Navy racers and the fact that later racers of other manufacturers were being given "F" designations (see F2W-1).

The F4C was designed by Charles Ward Hall as an experiment in all-metal construction that was essentially a rehash for comparative purposes of the earlier Curtiss-built Navy TS-1. Wings were built with tubular spars and stamped dural ribs; fuselage was built up of dural tubing in a Warren truss form. Major outward change from TS-1 design was raising of lower wing to bottom of fuselage.

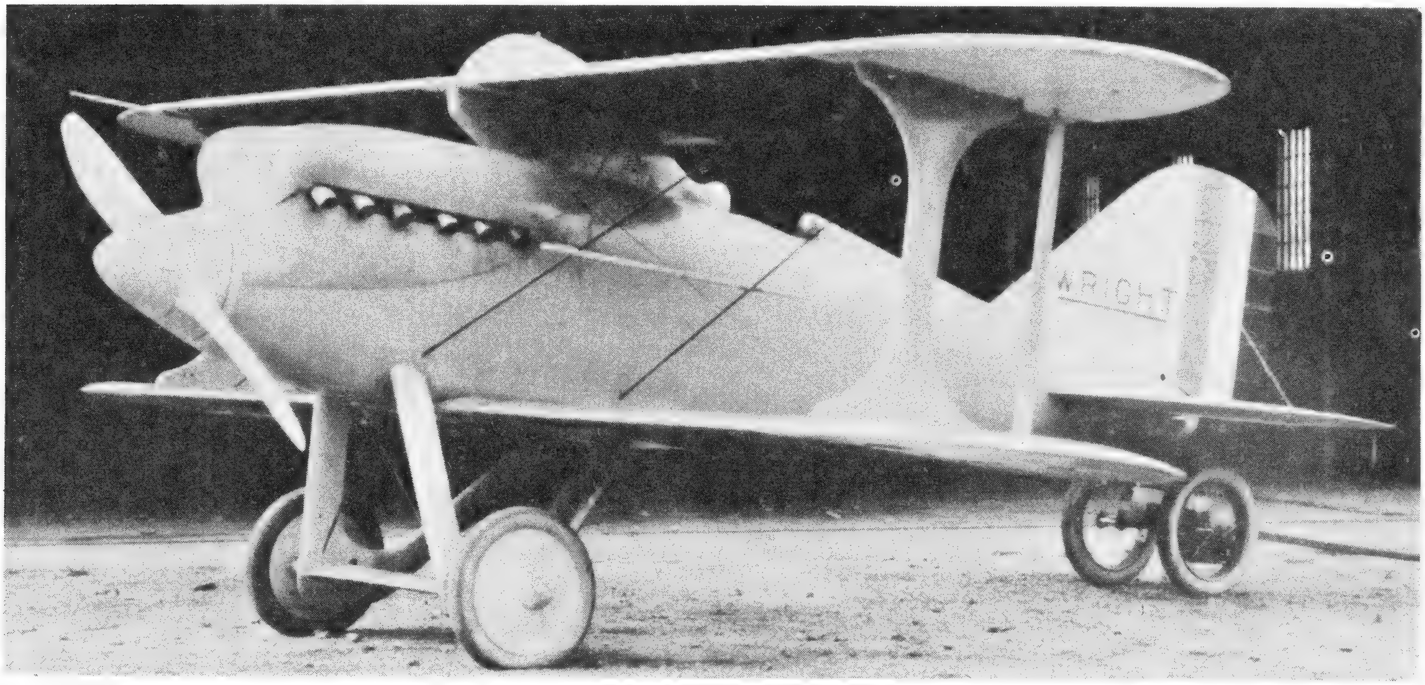
Specifications: 200 hp Wright J-3; Span 25'; Length 18' 4"; Area 173 sq. ft.; Gross weight 1703 lbs.; High speed 125 mph.

ber was not assigned until the airplane was purchased and became Navy property. Serials were assigned to un-built aircraft not even on the drawing boards when regular experimental or production contracts were drawn for their design and construction.

Although all of the fighters illustrated here are experimentals, the prefix letter X-for-Experimental does not always appear in the designation because the Navy did not officially identify experimental status of an airplane in the designation until 1927. The Navy did not use the Army system of also designating service test status of a design. Modifications to a basic design were identified by changes to the dash number following the designation. Dash-one indicated the original configuration. Major changes sometimes resulted in a brand new model number and at other times were cause only for change from "-1" to "-2." A change in the intended purpose of a given airplane was justification for a change in type as well as model number.

Failure of an experimental model to win production contracts was not to be considered an indication of an unsuccessful design. In some cases a "New" model was merely a last-ditch attempt to stretch out the service life of a series long in production while in others new structural features were tested on an airframe of conventional configuration for comparative evaluation before being incorporated in entirely new designs. In other cases, changing service requirements caused otherwise promising designs to be abandoned because there was no longer a need for them. Each experimental model, successful or otherwise, incorporated the best thinking and technology of its time and made its contribution to Air Progress.

The third installment of Forgotten Fighters, to appear in an early issue, will describe the corresponding experimental Army fighters of the between-wars years.

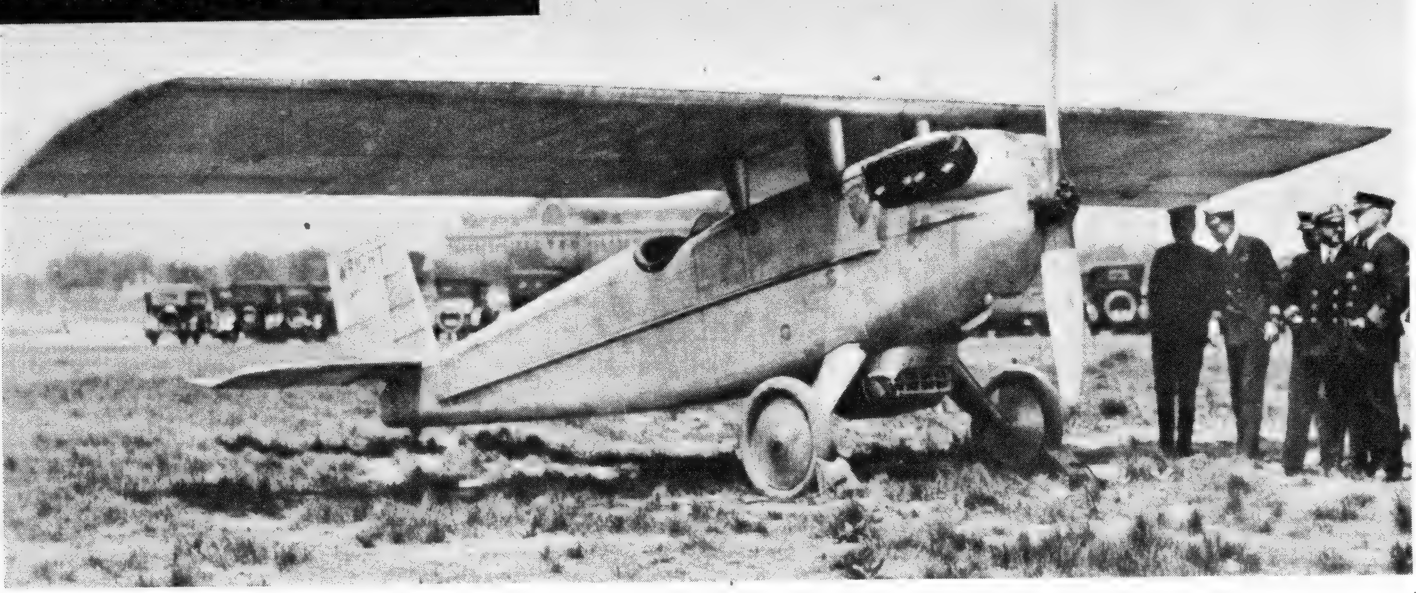


WRIGHT F2W-1 (6743, 6744) was ordered primarily for the 1923 Pulitzer race but was given F-for-Fighter designation instead of earlier R-for-Racer. (This could have been a dodge to get around an economy move that reduced funds for such things as racers.)

The fuselage was built up of two layers of spruce veneer over four longerons and plywood bulkheads. The fin and stabilizer used mahogany plywood over spruce frames and movable surfaces were steel tubing. Most unique feature was the installation of thin sheet brass "Skin" radiators on both surfaces of the spruce-planked wings. With three-blade props and the V-12 engines hopped up to 700 hp, the two F2W's placed 3rd and 4th in the race at 230 and 229 mph for four laps of the 32-mile closed course.

Specifications: 650 hp Wright T-3; Span 22′ 6″; Length 21′ 4″; Area 174 sq. ft.; Gross weight 3000 lbs.; High speed 240 mph.

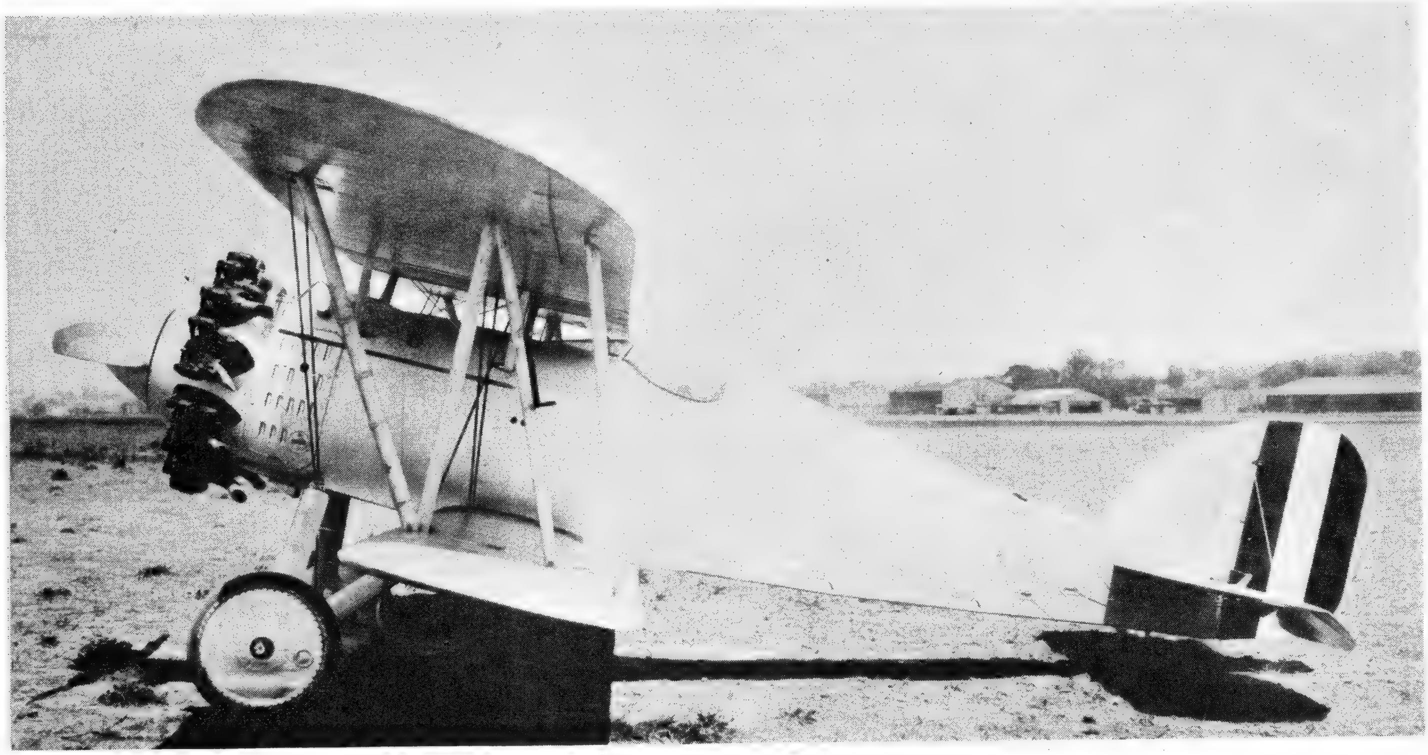
FORGOTTEN FIGHTERS



WRIGHT WP-1 (6748) was all-metal parasol monoplane developed from Dornier D-1 biplane of 1918. Built in Switzerland because of restrictions in Germany, Dornier "Falke" (Falcon) was submitted to Navy by Wright as P-for-Pursuit. Some Navy documents list it as P-for-Patrol but it was definitely a fighter. Only "Americanized" feature was installation of Wright-built Hispano-Suiza V-8 engine.

Wing spars were steel with ribs and other structure dural, smooth dural skin for covering. Single-strut landing gear had shock units inside fuselage. Originally, Navy aircraft designating system put initial of manufacturer first, then type symbol. Order was soon reversed and second Wright fighter was F2W-1. Later serial number of WP-1 results from fact that it was not actually bought by Navy until after F2W's had been ordered.

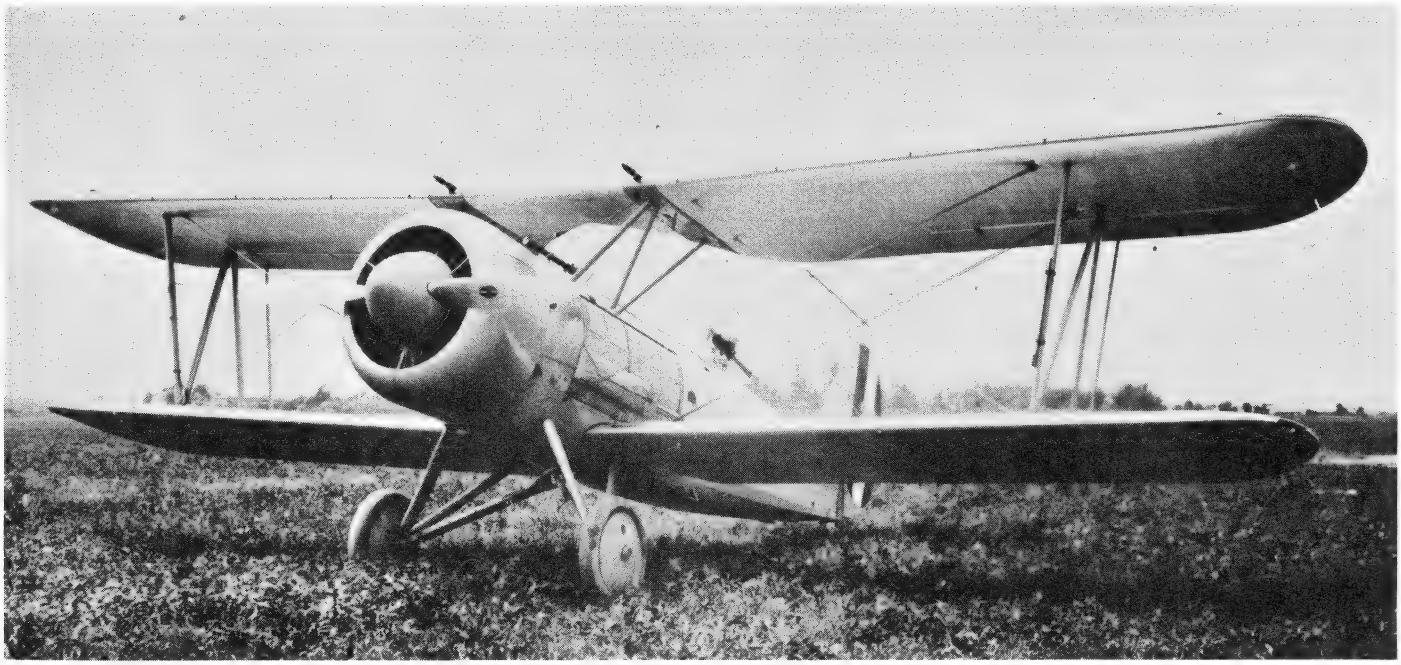
Specifications: 340 hp Wright H; Span 32′ 10″; Length 24′ 6″; Area 215 sq. ft.; High Speed 162 mph.



WRIGHT F3W-1 (7223) was designed to use a new 350 hp Wright "Simoon" radial engine but the airplane was ready first and so was flown with 220 hp Wright J-5 radial. The Simoon did not go into production so the F3W finally used the new Pratt & Whitney "Wasp."

Construction was steel tubing for fuselage and tail, wood for the wings, fabric overall. Most distinctive feature was use of dihedral on upper wing only. The F3W was used extensively for research and test work, and set World altitude records four times: 37,995′ on 7-4-27, 38,474′ on 7-25-27, and 43,166′ on 6-4-30, all as a landplane; 38,500′ on 6-9-29 as a seaplane with single main pontoon and wingtip floats. Prefix X was added to F3W-1 designation in 1928 to indicate experimental status.

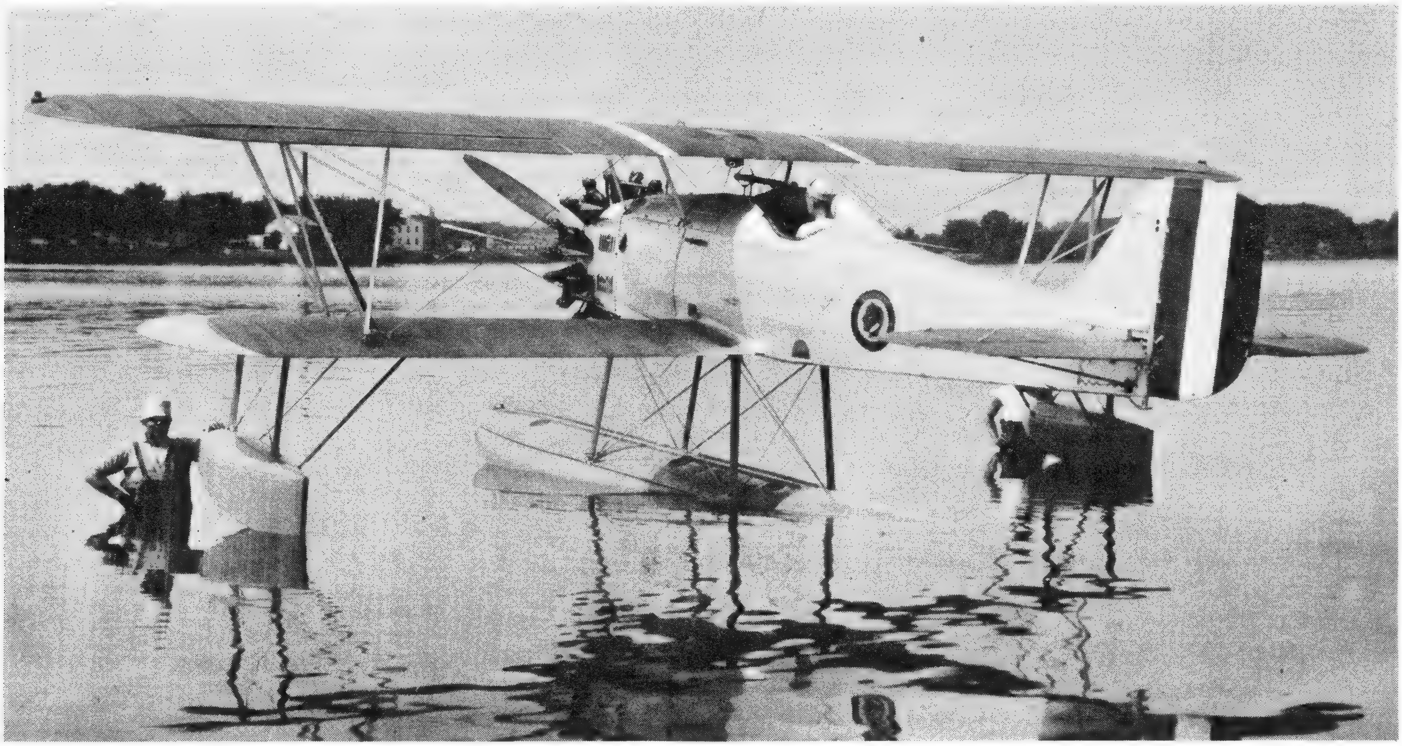
Specifications: 450 hp P&W "Wasp" R-1340-B; Span 27′ 4″; Length 22′ 3/4″; Area 215 sq. ft.; Gross weight 2128 lbs.; High Speed 162 mph.



VOUGHT XF2U-1 (7692) was first Vought attempt to design a 2-seat fighter from scratch. Other Voughts had been used as such but were all developments of other types (VE-7, UO-1, O2U-1). XF2U-1 was intermediate model between O2U-1, first of the famous "Corsair" series, and the later O3U series.

Fuselage was welded steel tubing with fuel tanks on each side of front cockpit with their outer surfaces exposed. Wings used wood spars and ribs with fabric cover over all. Forward-firing armament of two Browning machine guns was built into each side of upper wing center section while rear gunner had a single Lewis gun on a swivel mount. Wings differed from swept upper, straight lower of O2U-1 by having dihedral and sweepback on both, which became standard on all Vought biplanes until taper-winged XF3U and SBU series.

Specifications: 450 hp P&W "Wasp" R-1340-D; Span 36′; Length 27′; Area 318 sq. ft.; Gross weight 3886 lbs.; High speed 146 mph.



EBERHART FG-1 (7944) was ambitious attempt by Eberhart Aeroplane and Motor Co. (formerly Eberhart Steel Products Co.) to build a fighter with no previous experience other than rebuilding WW-1 S.E. 5's for the Army. First effort was company-named "Comanche" and tested by Navy in 1927 as FG-1.

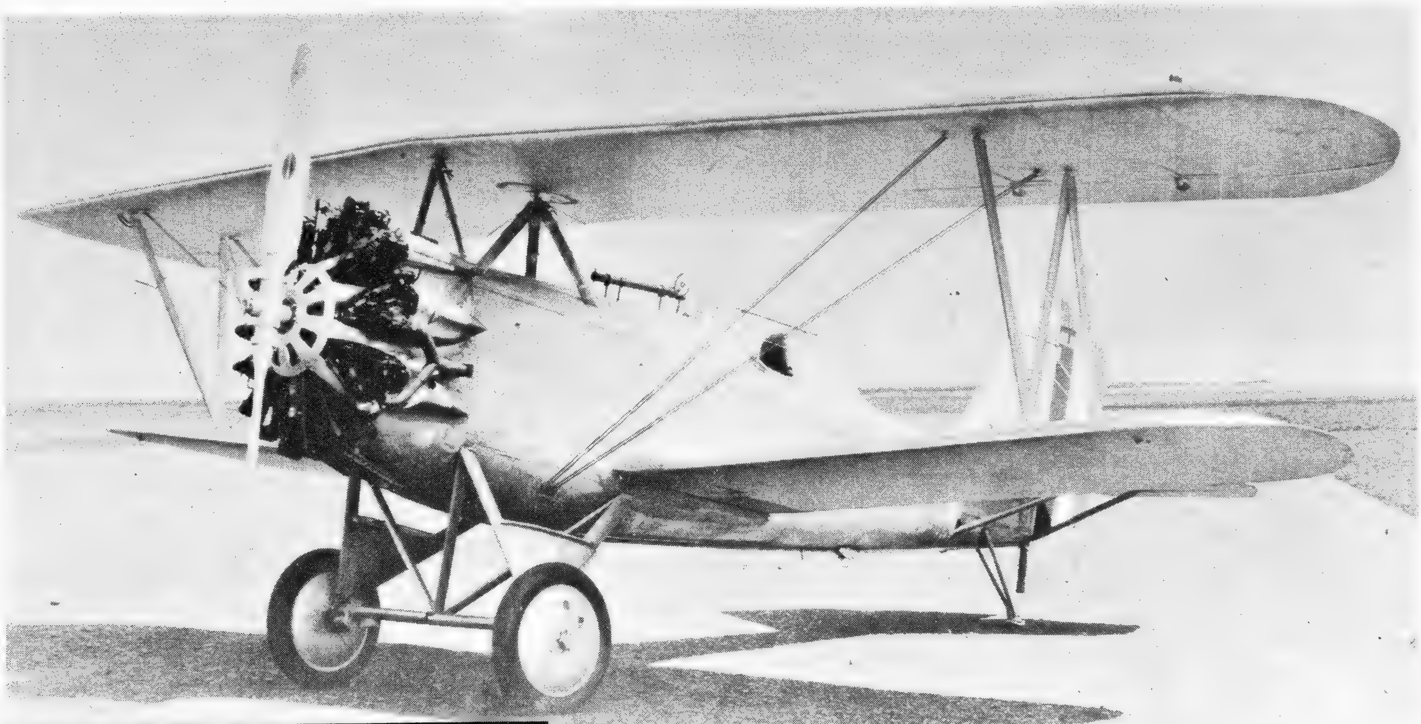
Fuselage was welded steel tube and wings used dural framework. Outstanding feature was 7° 15′ sweep back of upper wing and 5° 8′ sweep forward of lower. FG-1 was reworked to XF2G-1 illustrated with wingspan increase from original 28′ 9″. After the "Comanche" fighter and the "Iroquois" sport plane, Eberhart reverted to making metal equipment for other airplanes. Specs are for XF2G-1 seaplane.

Specifications: 450 hp P&W "Wasp" R-1340-D; Span 32′; Length 26′ 3-3/4″; Area 241.26 sq. ft.; Gross weight 3142 lbs.; High speed 155.5 mph.

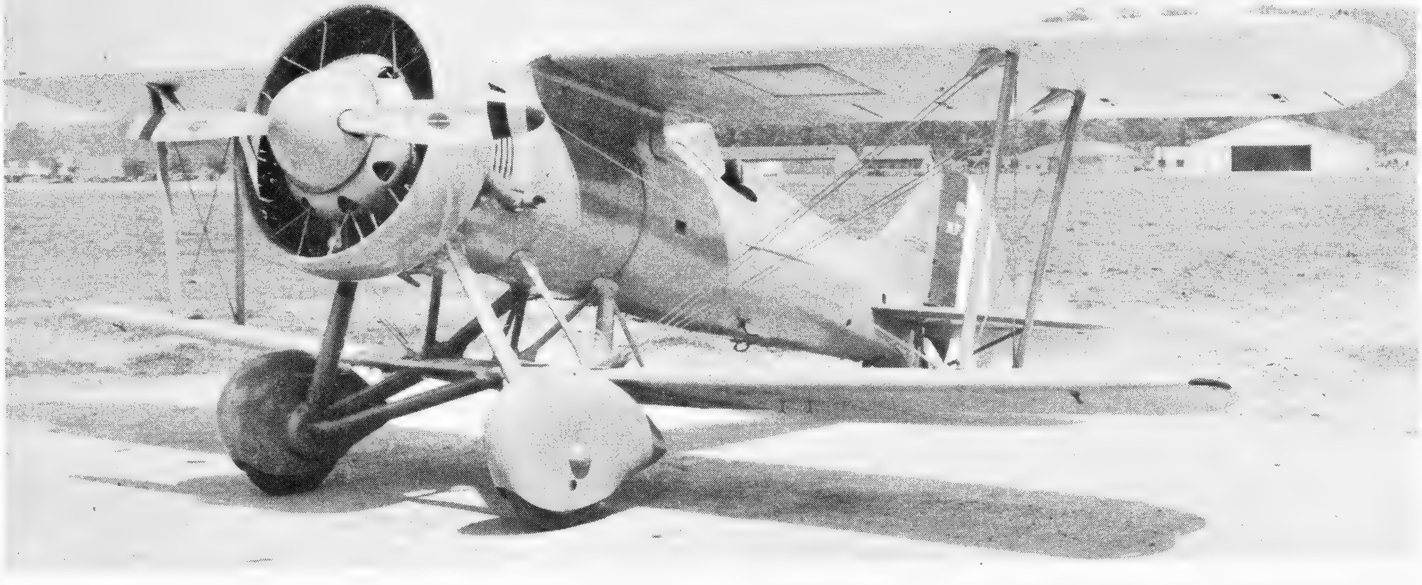
HALL-ALUMINUM XFH-1 (8009), all-metal fighter of 1929, designed by the same Charles Ward Hall of F4C-1 fame, incorporated a number of very unusual features. Most noticeable was the fact that the upper wing was swept back 6 degrees from the centerline while the lower wing was swept forward 4 degrees. The landing gear was jettisonable to keep the plane from nosing over in the event of a forced landing at sea and the fuselage was built as a series of water-tight compartments to keep the ship afloat.

The fuselage used the then-new stressed-skin semi-monocoque construction; the wings were conventional metal framework with fabric covering. XFH-1 was Hall's last fighter effort. He built PH patrol boats for the Navy in his own factory, then joined Consolidated, where he was responsible for the design of the XP3Y-1 that became the famous PBY.

Specifications: 450 hp P&W "Wasp" R-1340-B; Span 32′; Length 22′ 6-1/2″; Area 254.7 sq. ft.; Gross weight 2514 lbs.; High speed 152.5 mph.



FORGOTTEN FIGHTERS



BERLINER-JOYCE XFJ-1, 2 (8288) was of all-metal construction that had become standard at the time, with semi-monocoque stressed-skin fuselage and metal frame wings covered with fabric. Distinctive feature was the location of the lower wing below the fuselage and mounting of the upper wing directly on top.

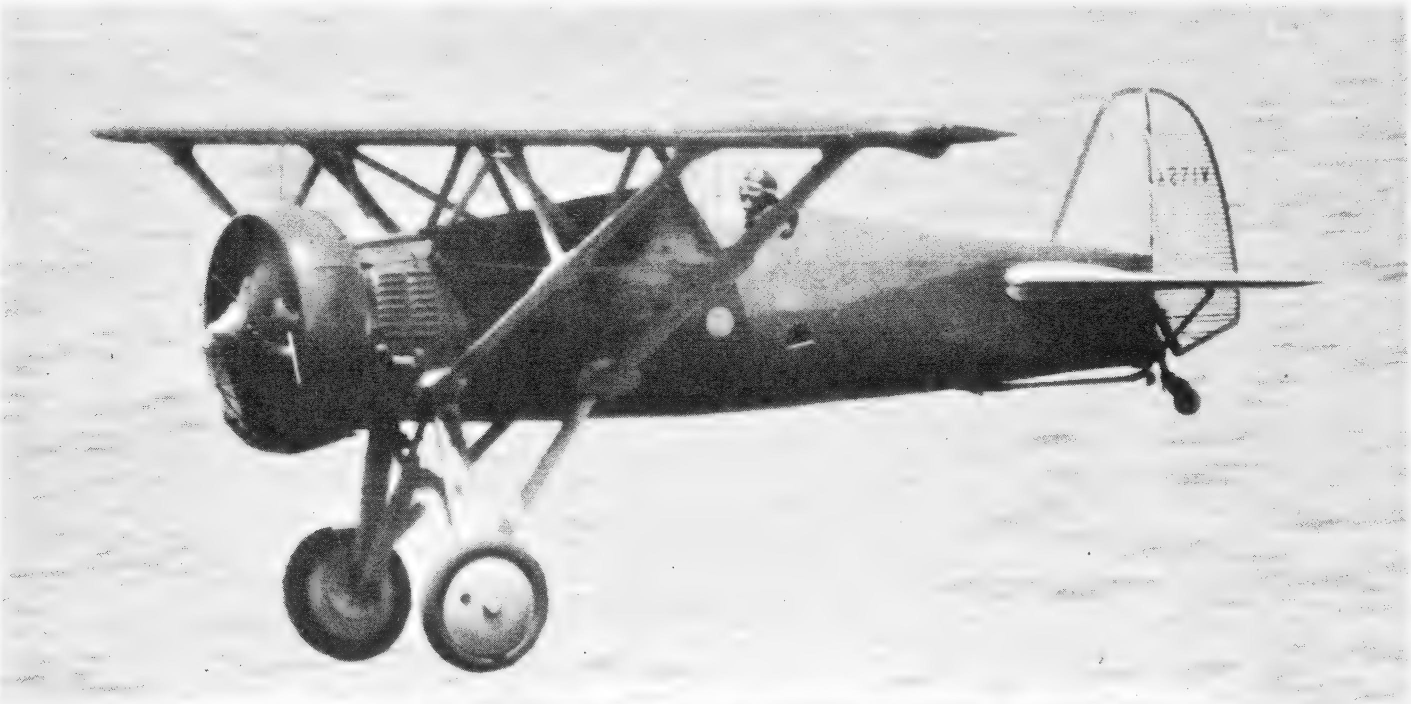
The original XFJ-1 had dihedral in the upper wing, but when it was converted to the XFJ-2 illustrated the dihedral was eliminated and the center section was gulled downward to meet the fuselage. A design throwback was use of cross-wire wing incidence bracing at a time when all other biplanes were using N-struts. Specs are for XFJ-2.

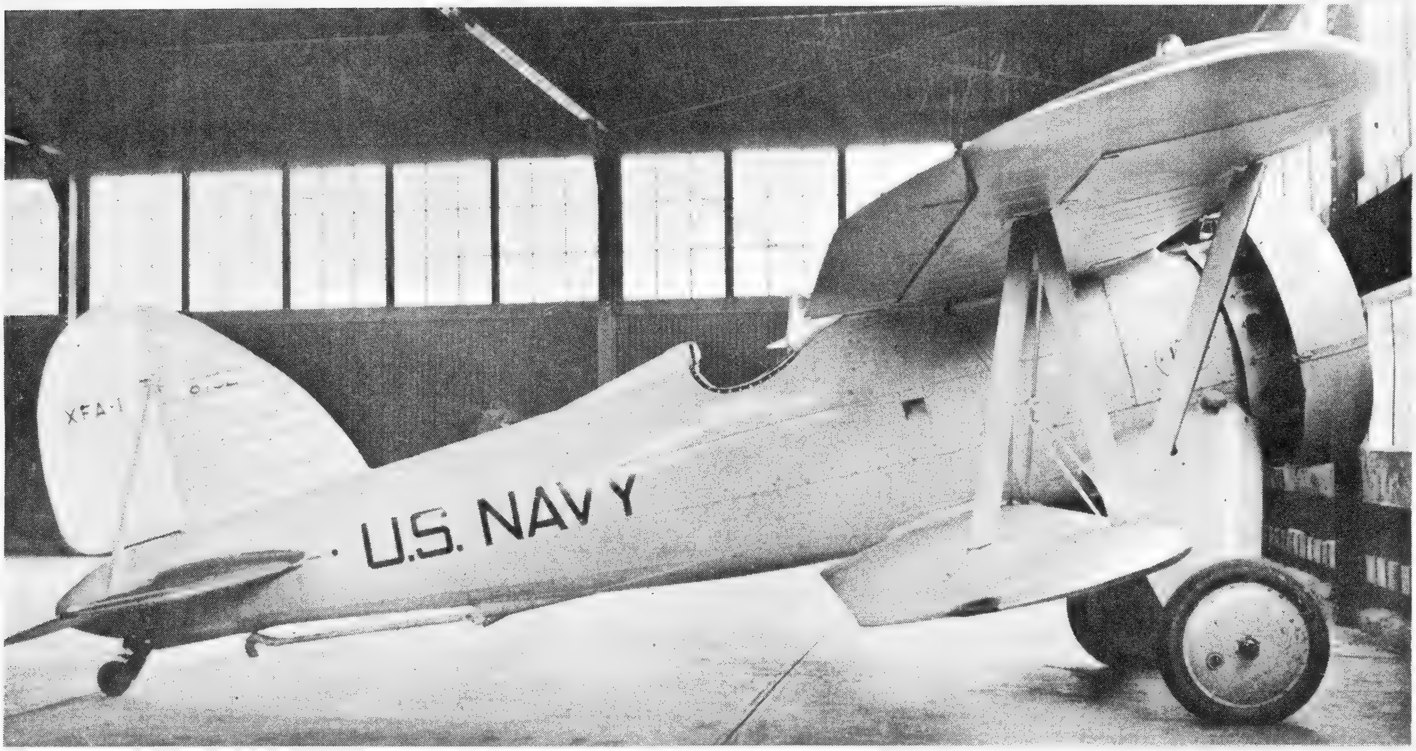
Specifications: 450 hp P&W "Wasp" R-1340-92; Span 28′ 6″; Length 20′ 7-1/4″; Area 178.6 sq. ft.; Gross weight 2847 lbs.; High speed 176.6 mph at sea level.

BOEING XF5B-1 (8640) was essentially a Boeing F4B-1 (*Air Progress*, Spring, 1958) with all-metal construction and without a lower wing. A duplicate parasol monoplane was tested by Army as XP-15. Both started with original F4B/P-12 vertical tail shape but changed to rounded type illustrated, which was incorporated for P-12E/F4B-3 and subsequent models.

The fuselage of XP-15 and XF5B-1 (Boeing Models 202 and 205) were of semi-monocoque construction later adopted for P-12E/F4B-3. The wing differed from standard Boeing practice in being all metal frames covered with smooth non-stressed metal skin. XF5B-1 was delivered in February, 1930, and after flight testing was static-tested to destruction to evaluate the new structural features.

Specifications: 485 hp P&W "Wasp" R-1340-C; Span 30′ 6″; Length 21′; Area 157.3 sq. ft.; Gross weight 2808 lbs. (fighter), 3319 lbs. (bomber); High speed 171 mph at 8000 ft.



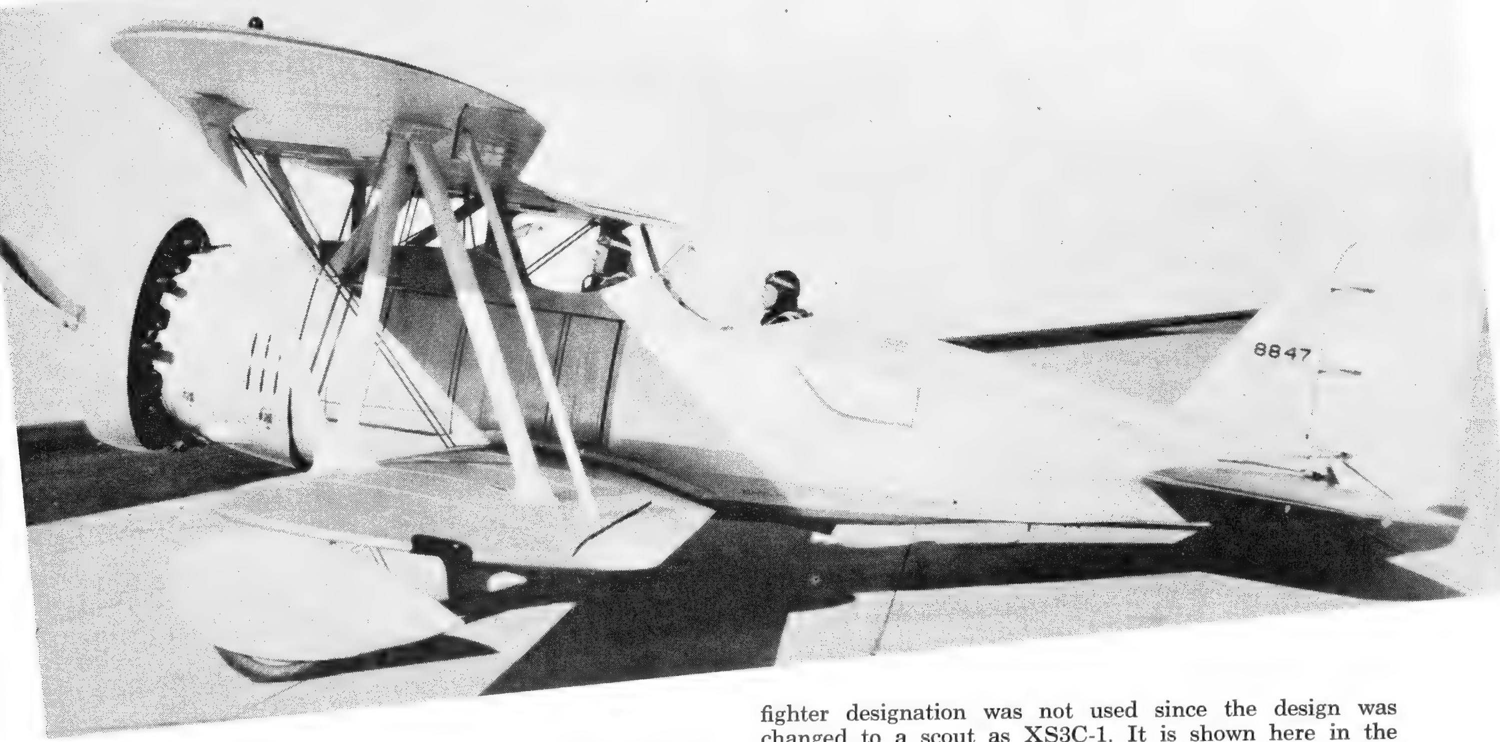


GENERAL XFA-1 (8732) was lightweight all-metal shipboard fighter built to same Bureau of Aeronautics Design, No. 96, as the famous Curtiss F9C "Sparrowhawk" (*Air Progress*, Fall, 1958) and carried the next Navy serial number after the XF9C-1.

Fuselage construction was somewhat unconventional in that dural sheets were bent inward at some joints and riveted through internal flanges instead of by the traditional lap joints. The landing gear shock absorbers were inside large rigid sheet dural legs. General Aviation Corporation was a continuation of old Fokker Aircraft Corporation of America, later Atlantic Aircraft, and retained the A-for-Atlantic designation letter. It later became part of North American Aviation, Inc., along with Berliner-Joyce.

Specifications: 400 hp P&W "Wasp Jr." R-985-A; Span 25′ 6″, Length 22′ 2-1/2″; Area 175 sq. ft.; Gross Weight 2508 lbs.; High speed 169.9 mph.

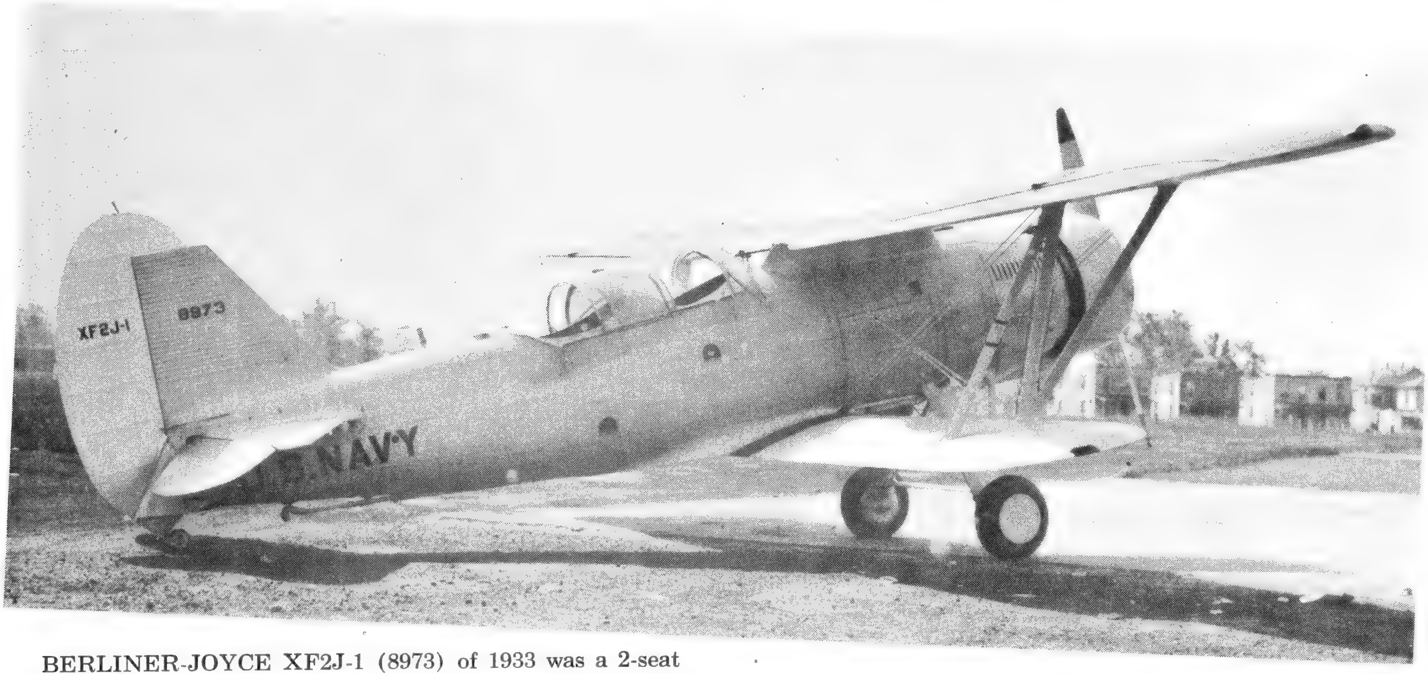
FORGOTTEN FIGHTERS



CURTISS XF1OC-1 (8847) was one of several designations given to a modified version of the well-known F8C/O2C "Helldiver (*Air Progress*, Fall, 1958). This particular airplane started as the XF8C-8 but was redesignated O2C-2 when fitted with revised tail surfaces.

The landing gear was later modified to single-strut type and the ship was to have become the XF1OC-1. The fighter designation was not used since the design was changed to a scout as XS3C-1. It is shown here in the final XS3C-1 form to fill the "hole" in the list of known Curtiss fighter designations. Specs are for the early O2C-2 configuration.

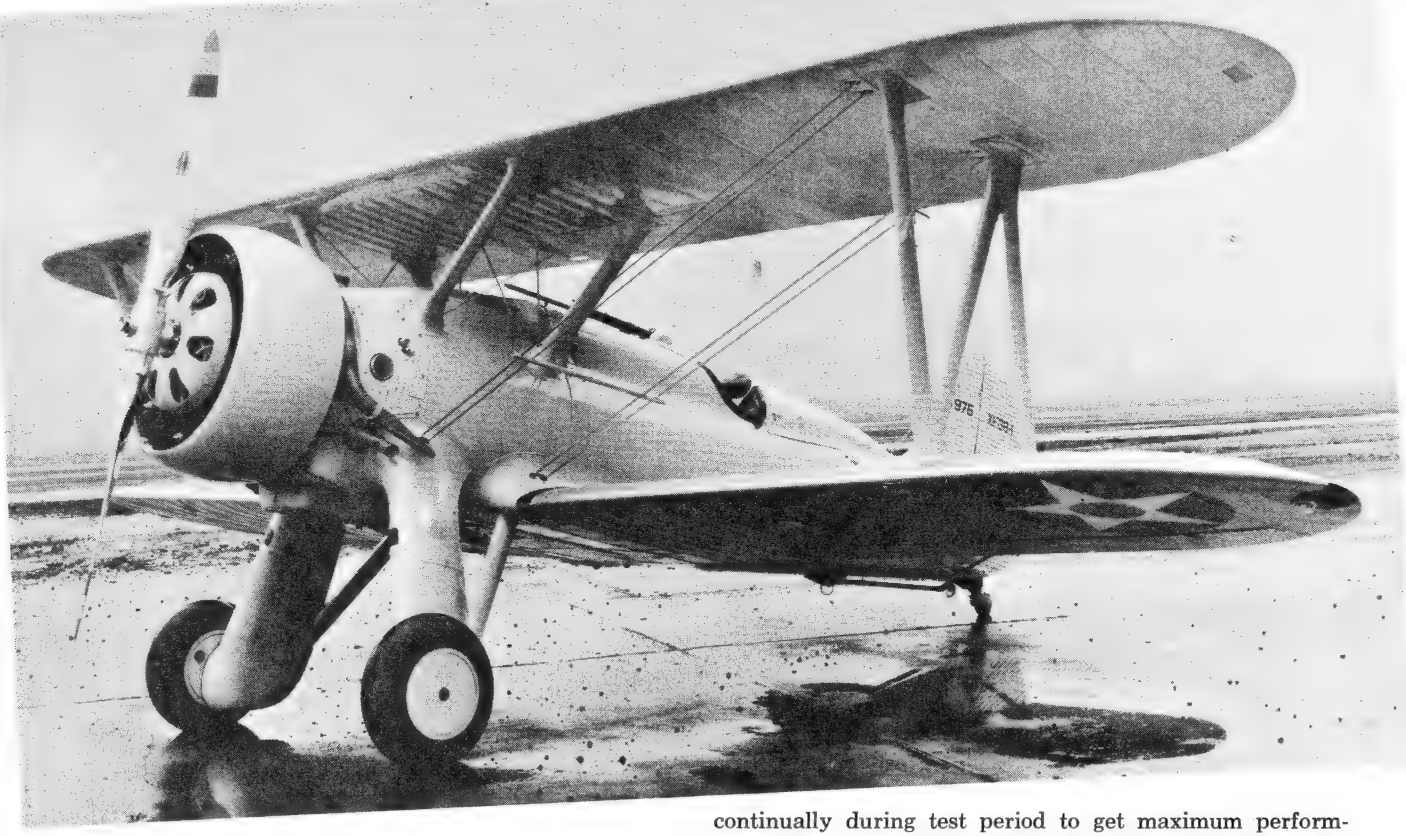
Specifications: 575 hp Wright "Cyclone" R-1820-E; Span 32'; Length 25' 7-7/8"; Area 308 sq. ft.; Gross Weight 4627 lbs.; High speed 174.1 mph.



BERLINER-JOYCE XF2J-1 (8973) of 1933 was a 2-seat fighter with a gulled upper wing based on that of the modified XFJ-2 single seater and the 2-seat P-16/PB-1 built for the Army (*Air Progress*, Fall, 1958). The XF2J-1 was originally designed for a single-row P&W "Hornet" R-1690-C radial engine but flew with a new experimental Wright 14-cylinder twin-row radial that was not put into production for service aircraft.

As first flown, the XF2J-1 had standard open cockpits but these were soon modified to the sliding-canopy type illustrated. Major production of the short-lived B/J company was 39 observation biplanes for Navy and fifteen 2-seat pursuits for Army.

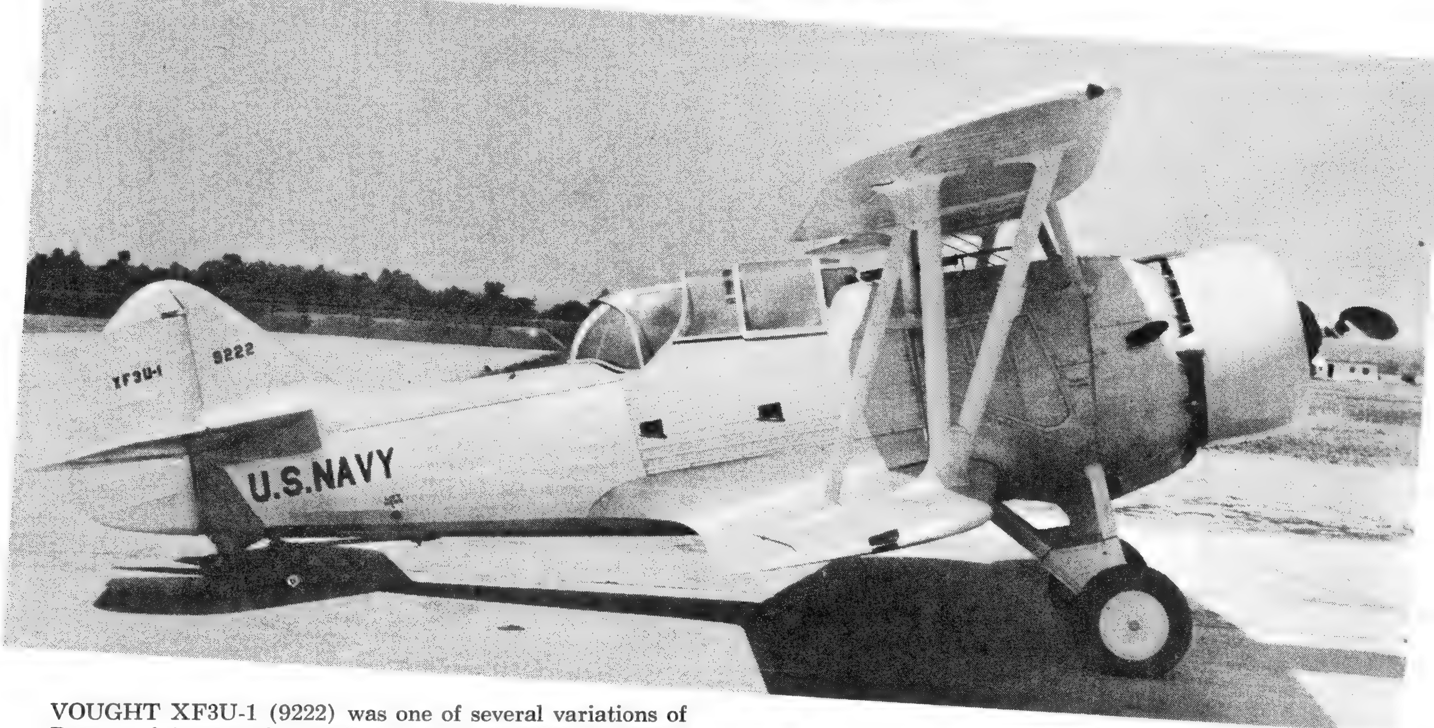
Specifications: 600 hp Wright SR-1510; Span 36'; Length 28' 9-15/16"; Area 303.5 sq. ft.; Gross Weight 4539 lbs.; High speed 196 mph at 6000 ft.



BOEING XF6B-1 (8975) was the last biplane design (Model 236) in the Boeing fighter series although modifications of earlier designs carried later model numbers. Export P-12E/F4B-4's were Model 256. Fuselage and tail construction were the same as late P-12/F4B except that wings used metal spars and ribs.

The landing gear and engine installations were refined continually during test period to get maximum performance. Like most other Navy fighters of the time, the XF6B-1 was designed to double as a dive bomber. In March, 1934, the Navy created new designations to cover dual-purpose aircraft and the XF6B-1 became the XBFB-1 fighter-bomber.

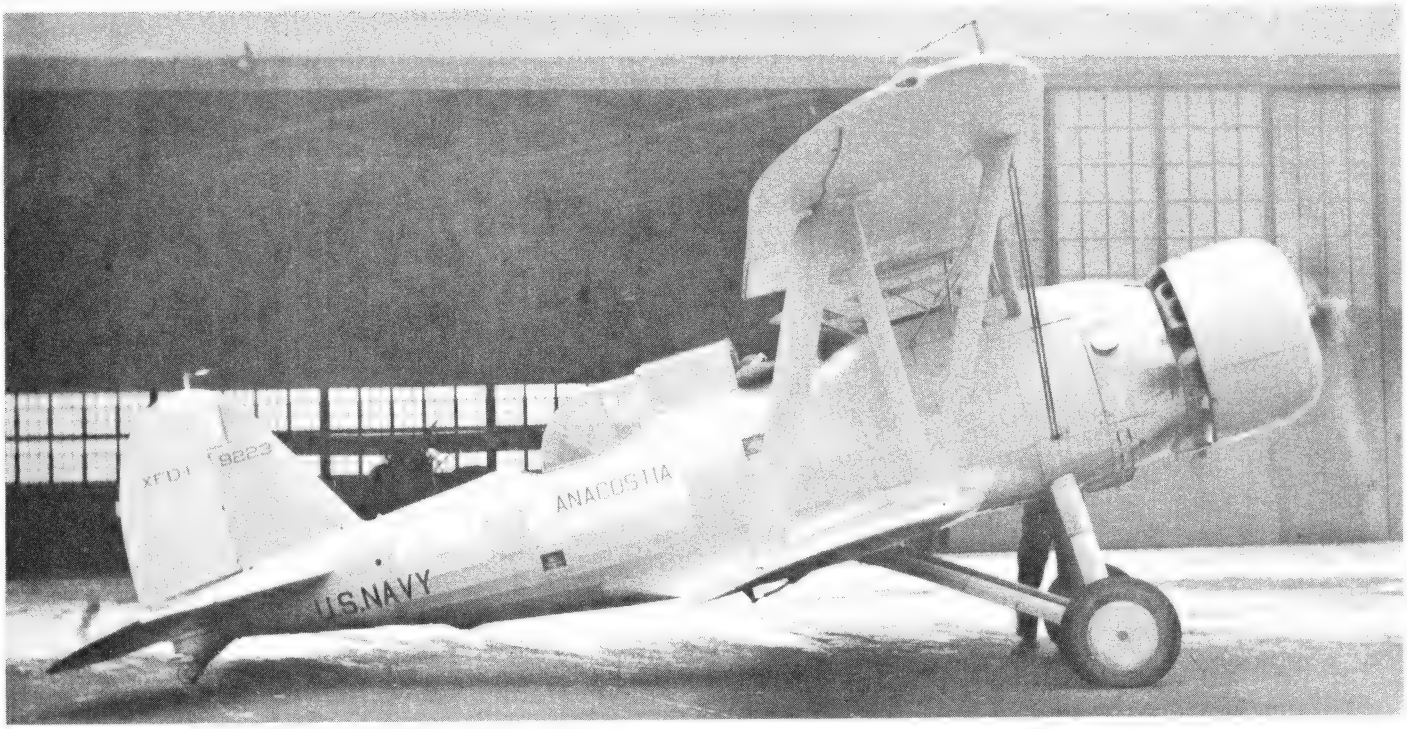
Specifications: 625 hp P&W "Twin Wasp" R-1535; Span 28′ 6″; Length 22′ 1-1/2″; Area 252 sq. ft.; Gross weight 3704 lbs. (fighter), 4282 lbs. (bomber); High speed 200 mph at 6000 ft.



VOUGHT XF3U-1 (9222) was one of several variations of Bureau of Aeronautics Design No. 113 produced by several manufacturers in 1933. Major departure from contemporary 2-seat biplanes was use of sharply tapered wings.

Structure was all metal with fabric covering. Split trailing edge flaps were fitted to lower wings because of weight increase over contemporary single-seat fighters of approximately the same dimensions. XF3U-1 was converted to dual-purpose scout bomber XSBU-1 and went into production as SBU-1, -2, and V-142 export model.

Specifications: 700 hp P&W "Twin Wasp" R-1535-64; Span 31′ 6″; Length 26′ 6-1/2″; Area 294.6 sq. ft.; Gross weight 4616 lbs.; High speed 205 mph at 8900 ft.



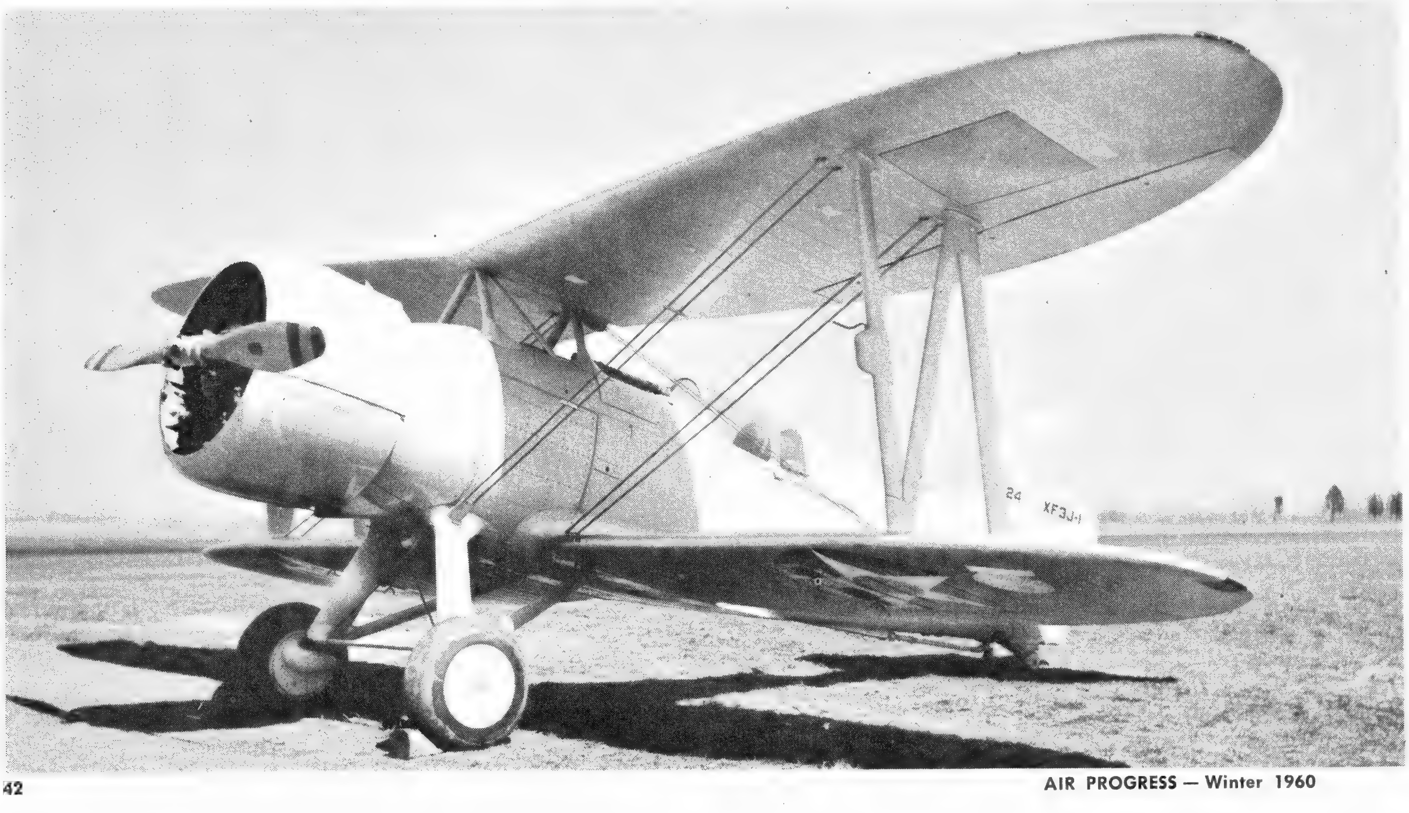
DOUGLAS XFD-1 (9223) was another taper-wing 2-seater developed from BuAer Design No. 113 and differed only slightly from Vought XF3U/XSBU. Great Lakes BG-1, built to BuAer Design 110, was very similar. All-metal fabric-covered XFD was only Douglas fighter built until jet F3D "Sky Knight" of Korean war. Douglas fame was built on observation planes in late 1920's and early 1930's and on transports in 1930's and 1940's.

Specifications: 700 hp P&W "Twin Wasp" R-1535-64; Span 31′ 6″; Length 25′ 4″; Area 295 sq. ft.; Gross weight 4685 lbs.; High speed 204 mph at 8900 ft.

BERLINER-JOYCE XF3J-1 (9224) was a single-seat carrier-based fighter developed from BuAer Design No. 120 in 1933 and marks the last attempt to prolong the life of the "fixed" landing gear biplane fighter in the Navy. Similar XFL-1 was developed by Loening but was cancelled before completion. Standard Navy practice was to work up basic designs for new models and turn them over to industry for completion. Navy did build some of its own airplanes, mostly prototypes, and placed production orders with industry.

XF3J-1 was conventional all-metal construction with semi-monocoque fuselage and fabric-covered metal frame wings. Principal features were odd planform of wings and use of dihedral on upper wing only.

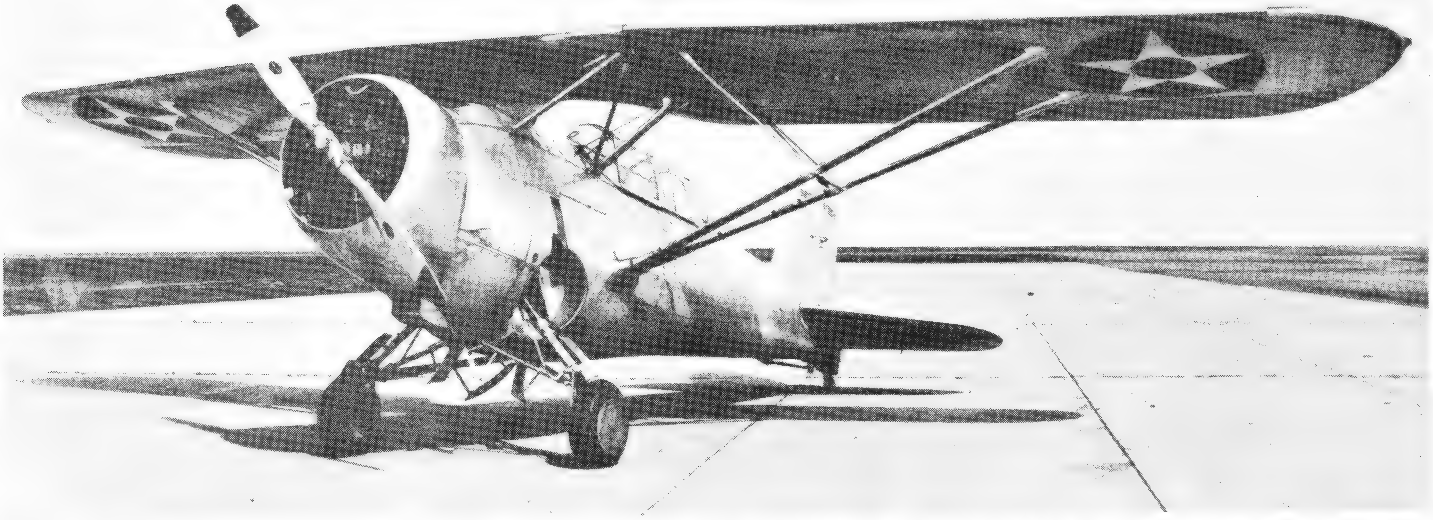
Specifications: 625 hp Wright XR-1510-26; Span 29′; Length 22′ 10-11/16″; Area 239.6 sq. ft.; Gross weight 4409 lbs.; High speed 209.3 mph at 6000 ft.



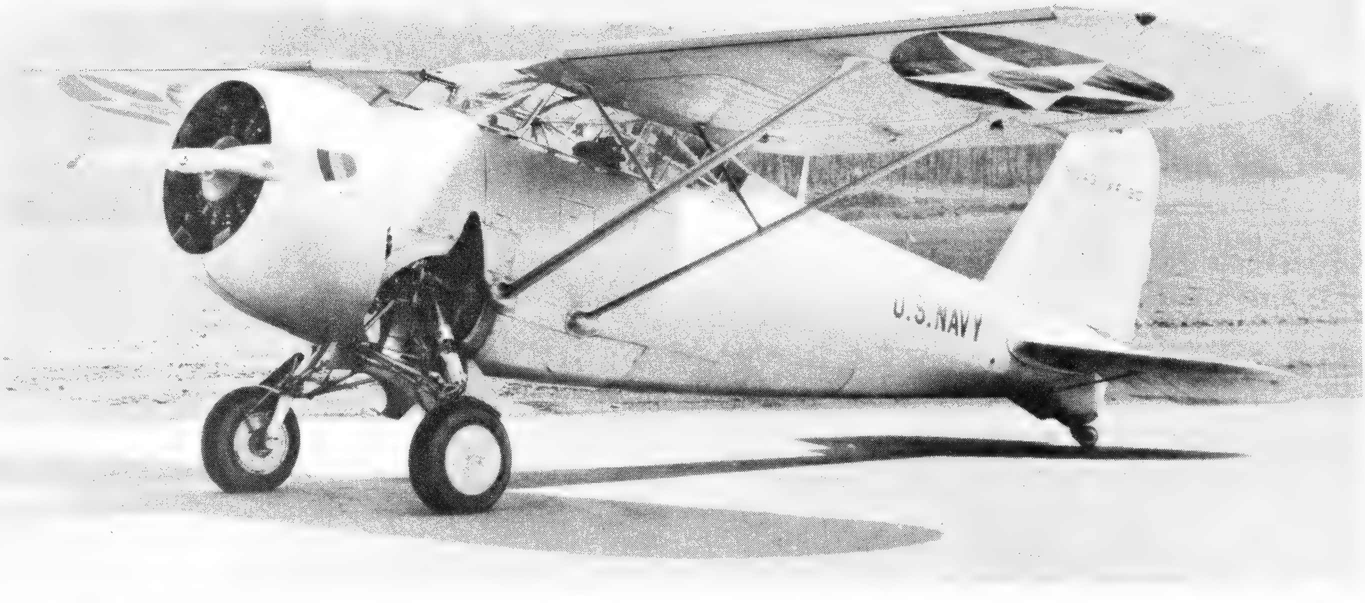
CURTISS XF12C-1 (9225) was based on a BuAer design for a two-seat fighter monoplane. Structure was all metal with semi-monocoque fuselage and metal-skinned frame wings. Full-span slots were fitted to the leading edge and flaps were used on trailing edge.

Originally a parasol monoplane with twin-row Wright SGR-1510 engine, the XF12C-1 (Curtiss Model 73) was converted to the XSBC-1 scout bomber in 1934 by installation of a single-row Wright SR-1820-80 "Cyclone" and then was converted to the XSBC-2 biplane (Model 77) with the twin-row XR-1510-12. It finally became the XSBC-3 with an additional change to the twin-row P&W R-1535 "Twin Wasp." Specs are for XF12C-1.

Specifications: 625 hp Wright SGR-1510; Span 41′ 3″; Length 28′ 5-3/4″; Area 272 sq. ft.; Gross weight 5379 lbs.; High speed 217.4 mph at 6000 ft.



FORGOTTEN FIGHTERS



CURTISS XFI3C-1, 2, 3 (9343) was second Curtiss attempt to produce a monoplane fighter for Navy. Earlier XF12C-1 was later Model 73 while single-seat XF13C was Model 70. Only previous Curtiss monoplane fighter was all-metal Model 66 tested by Army as XP-31.

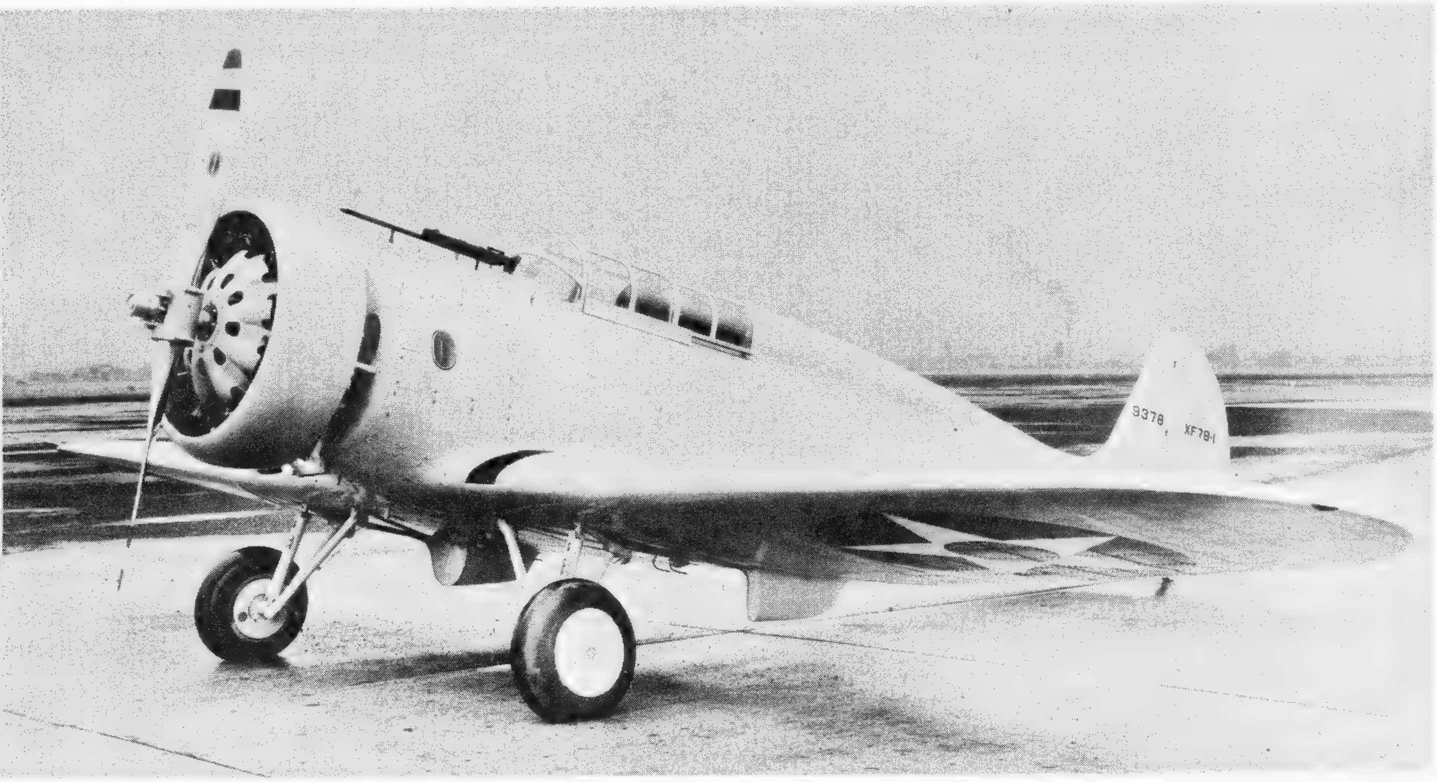
Structure was relatively standard for the time; only unconventional features of XF13C were strut-braced high-wing monoplane configuration for a fighter in -1 and -3 versions and fact that lower wings were available for conversion to biplane as XF13C-2. Complete history of the XF13C series was presented in *American Modeler* for March, 1958. Specs are for XF13C-1.

Specifications: 600 hp Wright XR-1510-2; Span 35′; Length 25′ 9-1/2″; Area 204 sq. ft.; Gross weight 4023 lbs.; High speed 223.9 mph at sea level.

BOEING XF7B-1 (9378) was first of "modern" all-metal low-wing single seaters with retractable landing gear tested by Navy but was too far ahead of time as Navy didn't order similar designs for carrier use until 1938. Delivered in November, 1933, XF7B was similar to Army P-29's but Navy—still biplane-minded—complained of high landing speed and poor visibility. Plane was returned to factory for installation of flaps that reduced landing speed to 66 mph and for conversion to open cockpit.

Designed to a load factor of 9, XF7B-1 was badly bent when inadvertently stressed to 12.1 "G" following windshield collapse in a 415 mph dive in March, 1935. It flew back to base safely but was scrapped as being beyond economical repair.

Specifications: 550 hp P&W "Wasp" SR-1340-30; Span 31′ 11″; Length 27′ 7″; Area 213 sq. ft.; Gross weight 3651.6 lbs.; High speed 233 mph at 10,000 ft.

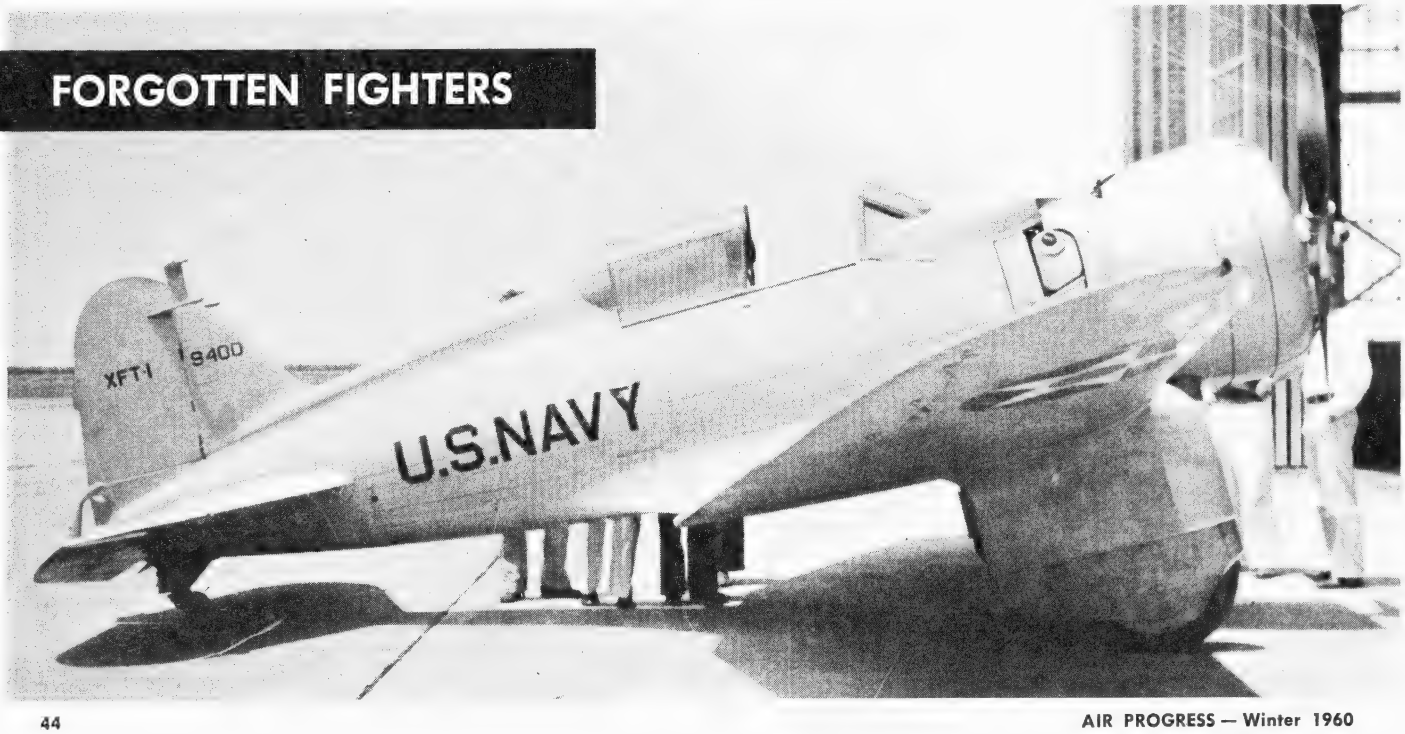


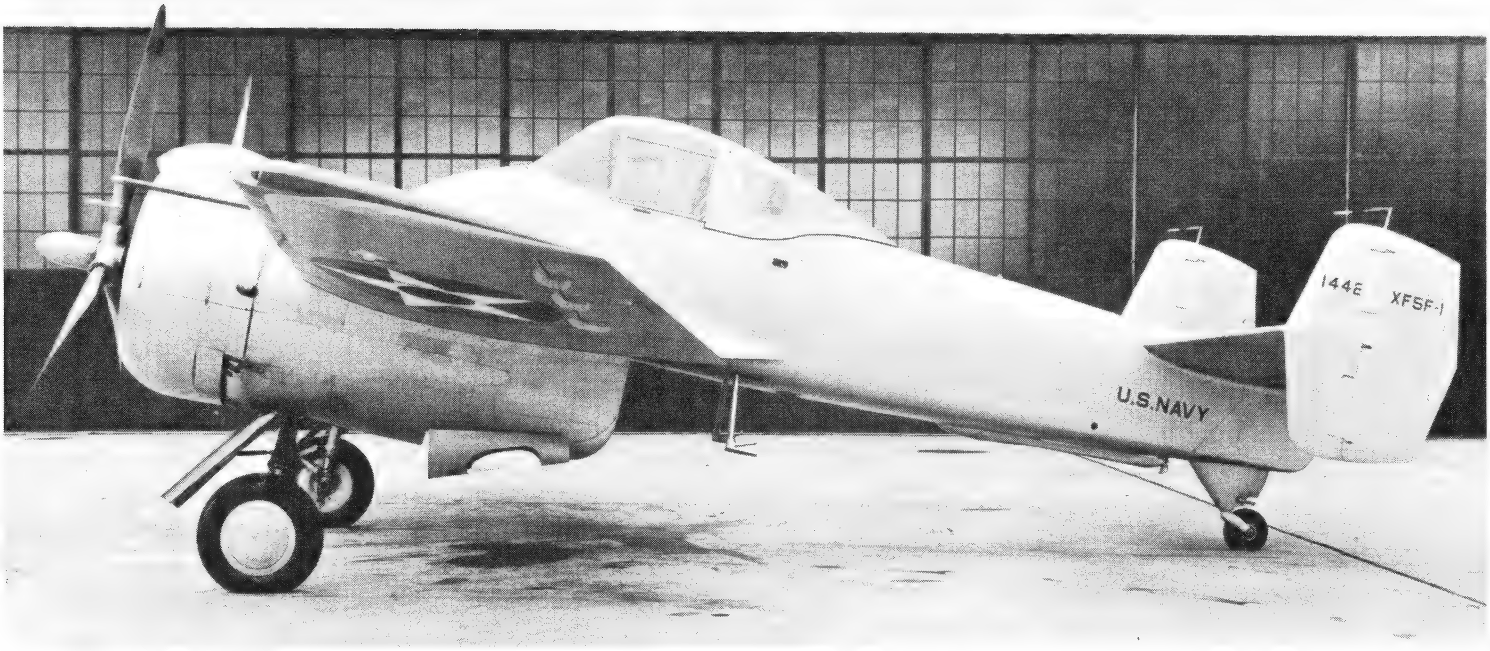
NORTHROP XFT-1 (9400) was a single-seat fighter based on the famous Northrop "Gamma" high speed mail and export attack planes. Unique fairing of the fixed landing gear was the most unusual feature of the XFT-1. Flaps were fitted to reduce landing speed and ailerons could be drooped to help out. Change to P&W R-1535 twin-row radial resulted in redesignation to XFT-2 and 16 mph reduction in high speed.

Northrop developed an improved version with retractable landing gear for Army and sold it to Vought; it was further refined as Vought's Model V-141 and V-143.

Specifications: 650 hp Wright XR-1510-8; Span 32′; Length 25′ 8-1/2″; Area 177 sq. ft.; Gross weight 3749 lbs.; High speed 250 mph at 8500 ft.

FORGOTTEN FIGHTERS

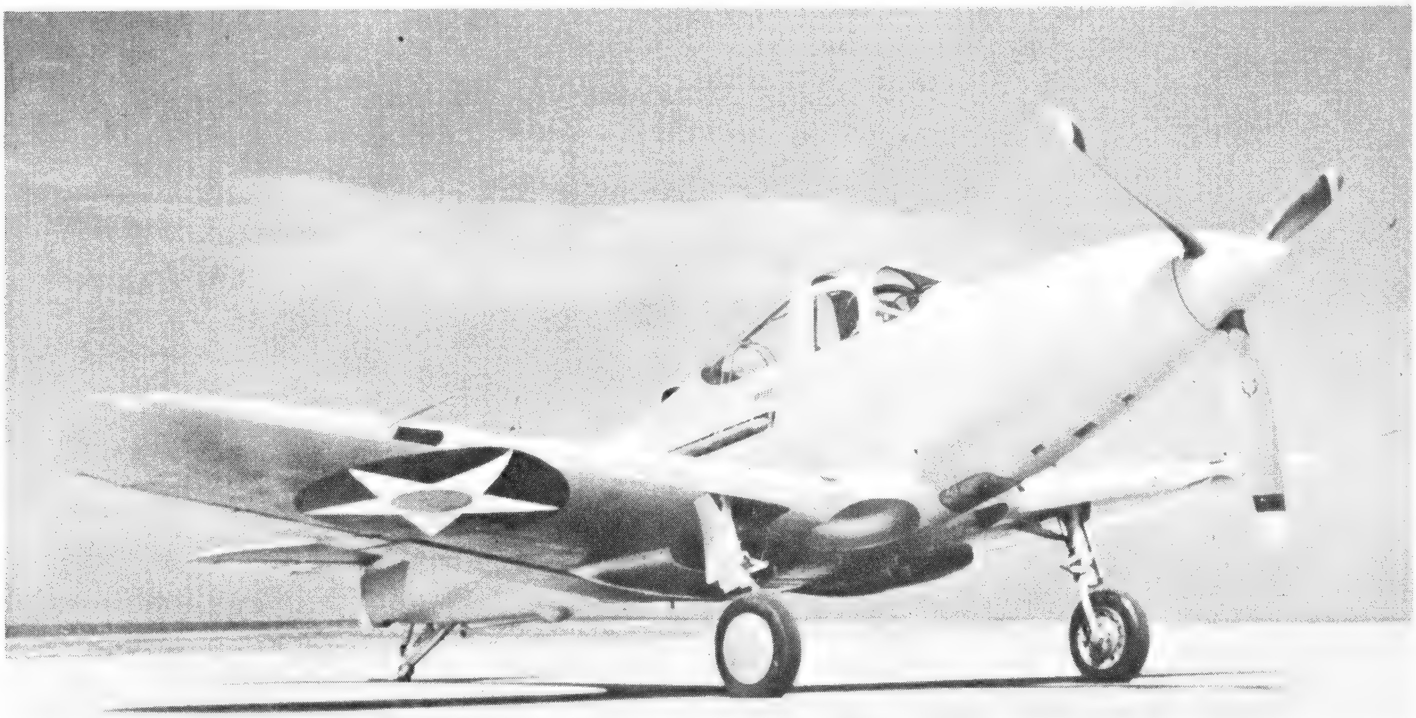




GRUMMAN XF5F-1 (1442) was first twin-engine single-seat fighter tested by Navy. Similar model was tested by Army as XP-50 just prior to WW-II. Low Navy serial number is result of starting over after original series reached 9999 in 1934.

Original form of XF5F-1 illustrated had extremely short nose that ended behind leading edge of low wing. This was modified in 1942 for improved streamlining and equipment stowage and projected well ahead of wing. XP-50 had long nose originally to house nose wheel of tricycle landing gear. XF5F-1 was first Grumman Navy fighter prototype not followed by production order, but experience was incorporated into late WW-II F7F twin-engine fighter series.

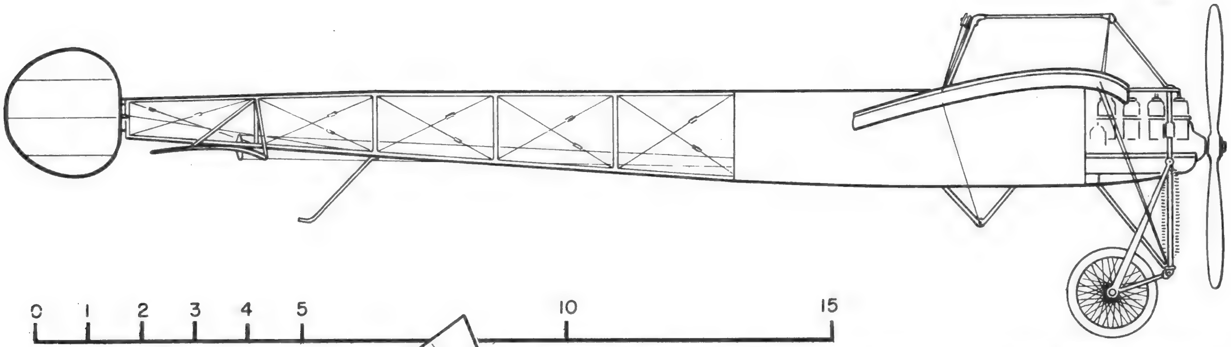
Specifications: 1000 hp Wright "Cyclone" XR-1820-40; Span 42′; Length 28′ 10-7/8″; Area 305.5 sq. ft.; Gross weight 9758 lbs.; High speed 348 mph at 16,000 ft.

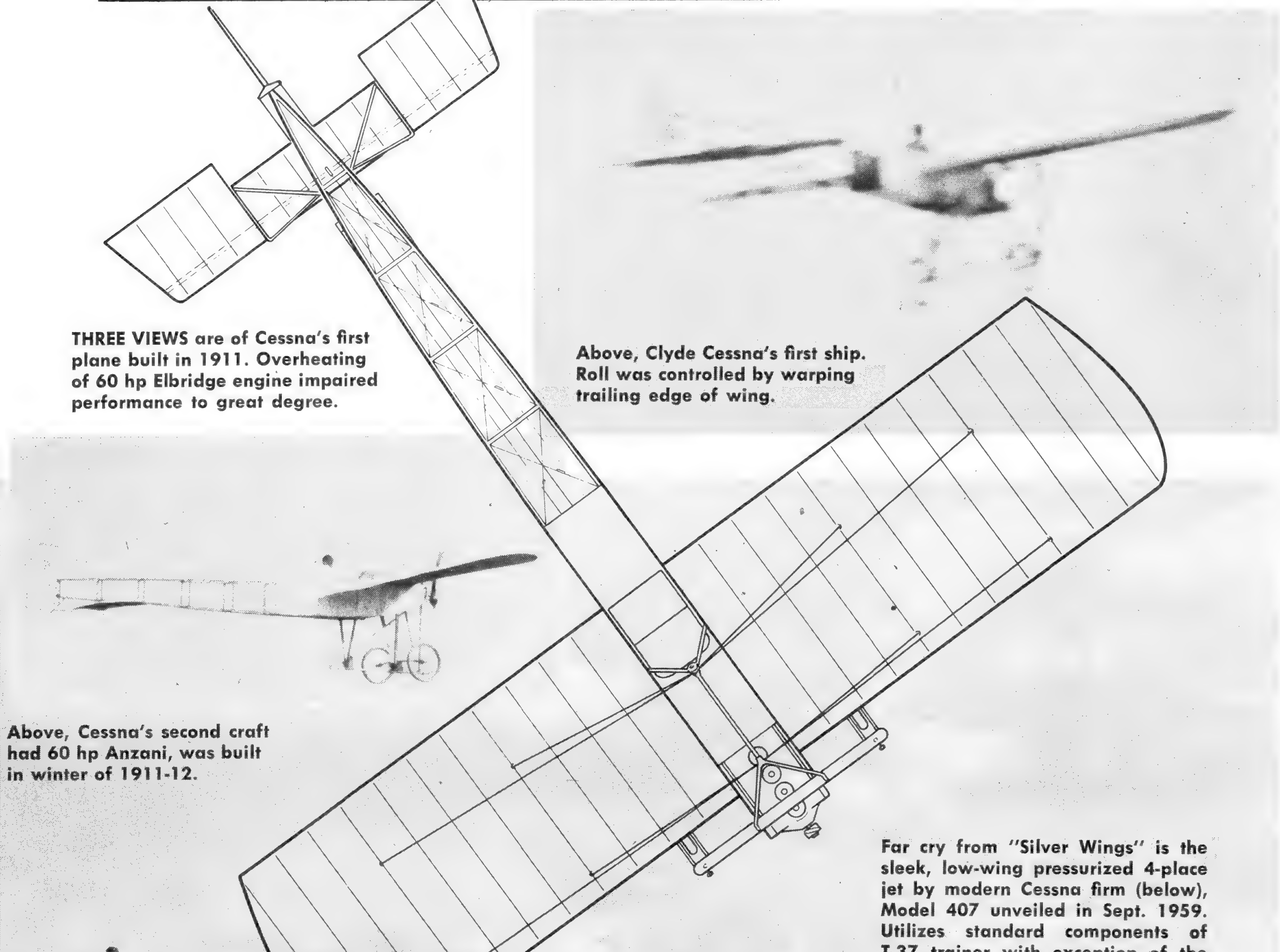


BELL XFL-1 (1588); an experimental carrier-based development of unique Army P-39 "Airacobra" with engine located amidships, was given name of "Airbonita." Principal difference from P-39 was use of conventional two-wheel landing gear since tricycle was not considered suitable for carrier operations at the time. Relocation of main landing gear to forward part of wing resulted in relocation of radiators on inside of wing roots to exterior locations under rear part of center section.

Use of liquid-cooled V-12 engine was notable exception to the old Navy rule of air-cooled engines only for Fleet airplanes which was established in 1928. Bell job was second use of XFL-1 designation originally assigned to uncompleted Loening model in 1932.

Specifications: 1150 hp Allison XV-1710-6; Span 35′; Length 29′ 9-1/8″; Area 232 sq. ft.; Gross weight 6651 lbs.; High speed 338 mph at 11,000 ft.



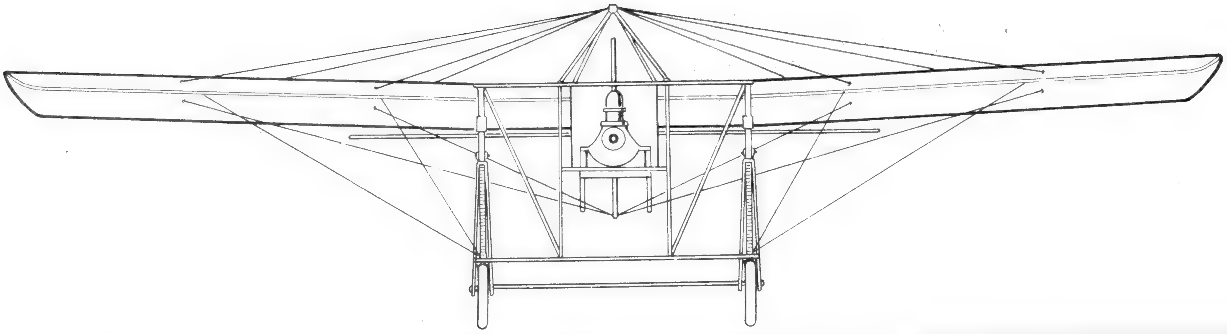


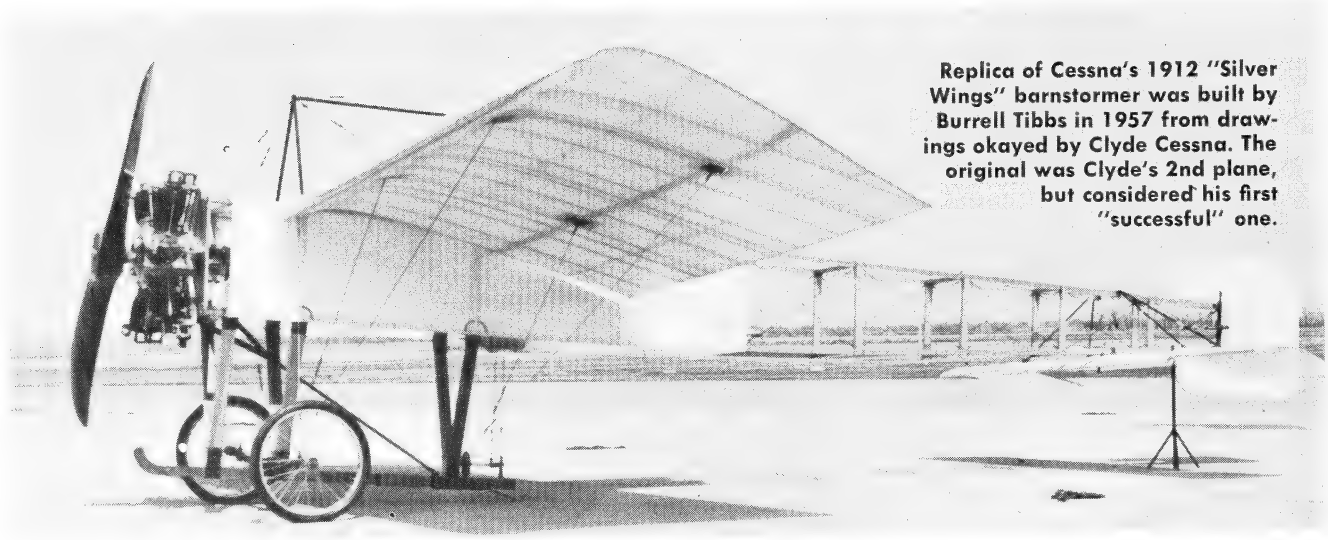
THREE VIEWS are of Cessna's first plane built in 1911. Overheating of 60 hp Elbridge engine impaired performance to great degree.

Above, Clyde Cessna's first ship. Roll was controlled by warping trailing edge of wing.

Above, Cessna's second craft had 60 hp Anzani, was built in winter of 1911-12.

Far cry from "Silver Wings" is the sleek, low-wing pressurized 4-place jet by modern Cessna firm (below), Model 407 unveiled in Sept. 1959. Utilizes standard components of T-37 trainer with exception of the cockpit, predicted cruise 465 mph.





Replica of Cessna's 1912 "Silver Wings" barnstormer was built by Burrell Tibbs in 1957 from drawings okayed by Clyde Cessna. The original was Clyde's 2nd plane, but considered his first "successful" one.

THE CESSNA STORY

■ The Cessna Aircraft Company was founded by Clyde V. Cessna, who grew up on his father's homestead east of Rago, Kansas. In 1910, when Clyde was 31 years old and in charge of an Enid automobile agency, he became curious about aviation when he read that the "International Aviators" were to put on an air circus at Oklahoma City. Clyde attended this air circus and became very interested in aviation when he learned that the pilots received from $500 to $1,000 per performance. He was especially interested in a monoplane, flown by a Frenchman, who had an identical model to that which Louis Bleroit had flown from Baraque, France, across the English Channel to Dover in 37 minutes . . . a world's record for speed and distance.

After the show was over, Clyde lingered at the railroad siding as the aviators took their planes apart and loaded them on the cars. He paid no attention to the biplanes; his entire interest was with the Bleroit monoplane. Clyde took pencil notes of what he saw and confined in his memory the things that he wanted to remember about the monoplane.

Clyde returned to Enid, Oklahoma, where he rented a garage and started to build his first airplane. He spent all winter building an airplane which greatly resembled the Bleroit monoplane. It was powered with a 60 h.p. Elbridge, four cycle, water cooled engine. After more than a dozen attempted flights which resulted in crack-ups, Clyde Cessna flew his first airplane successfully over the salt plains near Jet, Oklahoma. This was quite a feat since you must consider that Clyde not only was flight testing an experimental aircraft, but was also teaching himself how to fly at the same time. During the fall of 1911, Clyde flew aerial exhibitions at Jet and Cherokee, Oklahoma. This was all of the activity for 1911.

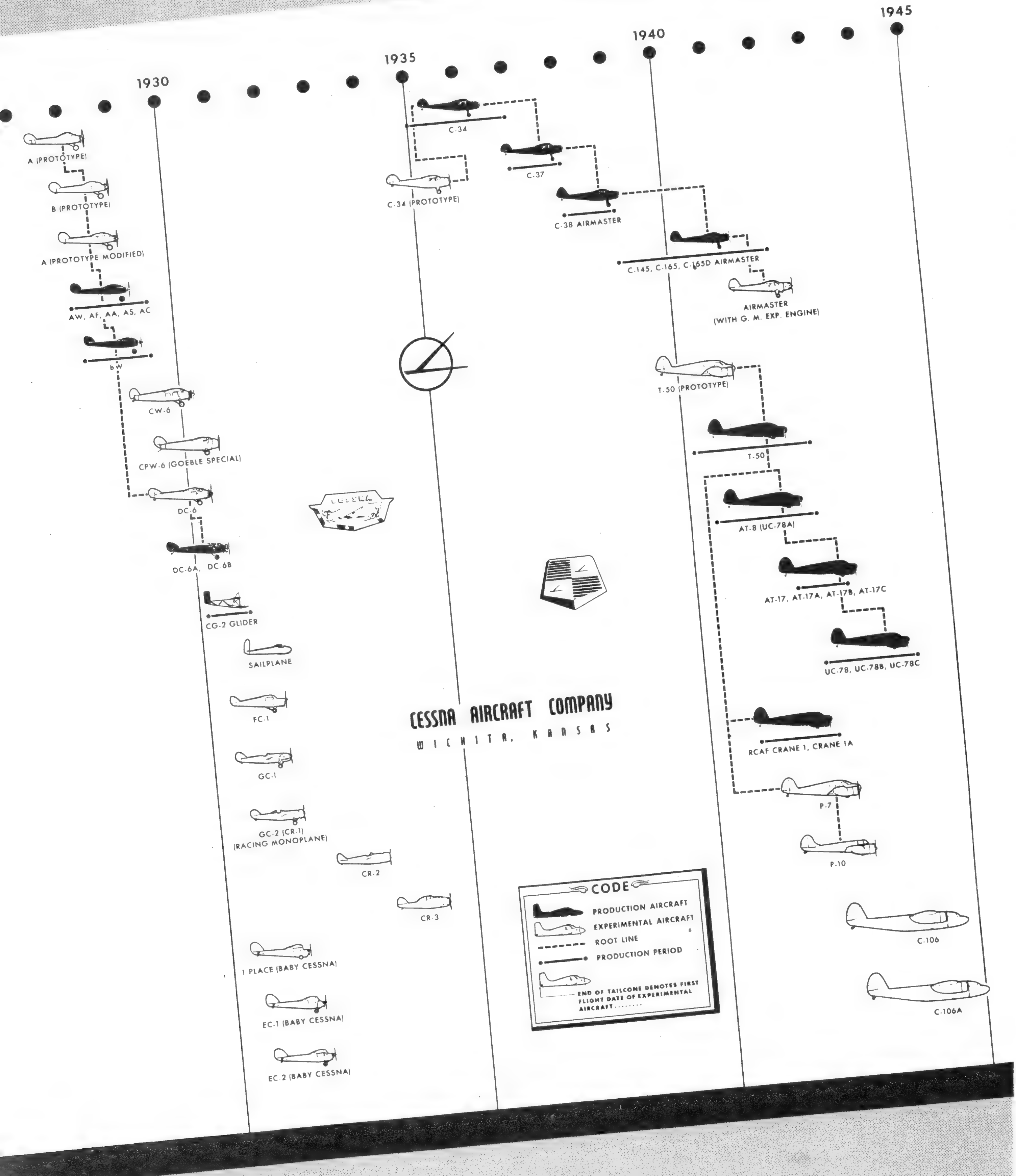
During the winter of 1911-1912, Clyde returned to Rago, Kansas, where he owned 40 acres of land with a barn on it, but no house. In the hayloft, he made a place for his wife and two children. On the ground floor he set up a shop. During this winter, he completely re-built the airplane correcting the deficiencies he had noted during his 1911 flights. The most drastic changes were a new landing gear and the replacement of the Elbridge with an Anzani air cooled engine. Early in 1912, he flight tested his new airplane ("Silver Wings") and was ready for a tour of flying exhibits. All during 1912, he flew one exhibit after another and the money rolled in. The next winter, he built his 1913 plane and provided a comfortable home for his family. From 1911 to 1925 he made 15 planes. He made no planes for others except once. He made them for himself as he flew the hedgehopper circuit.

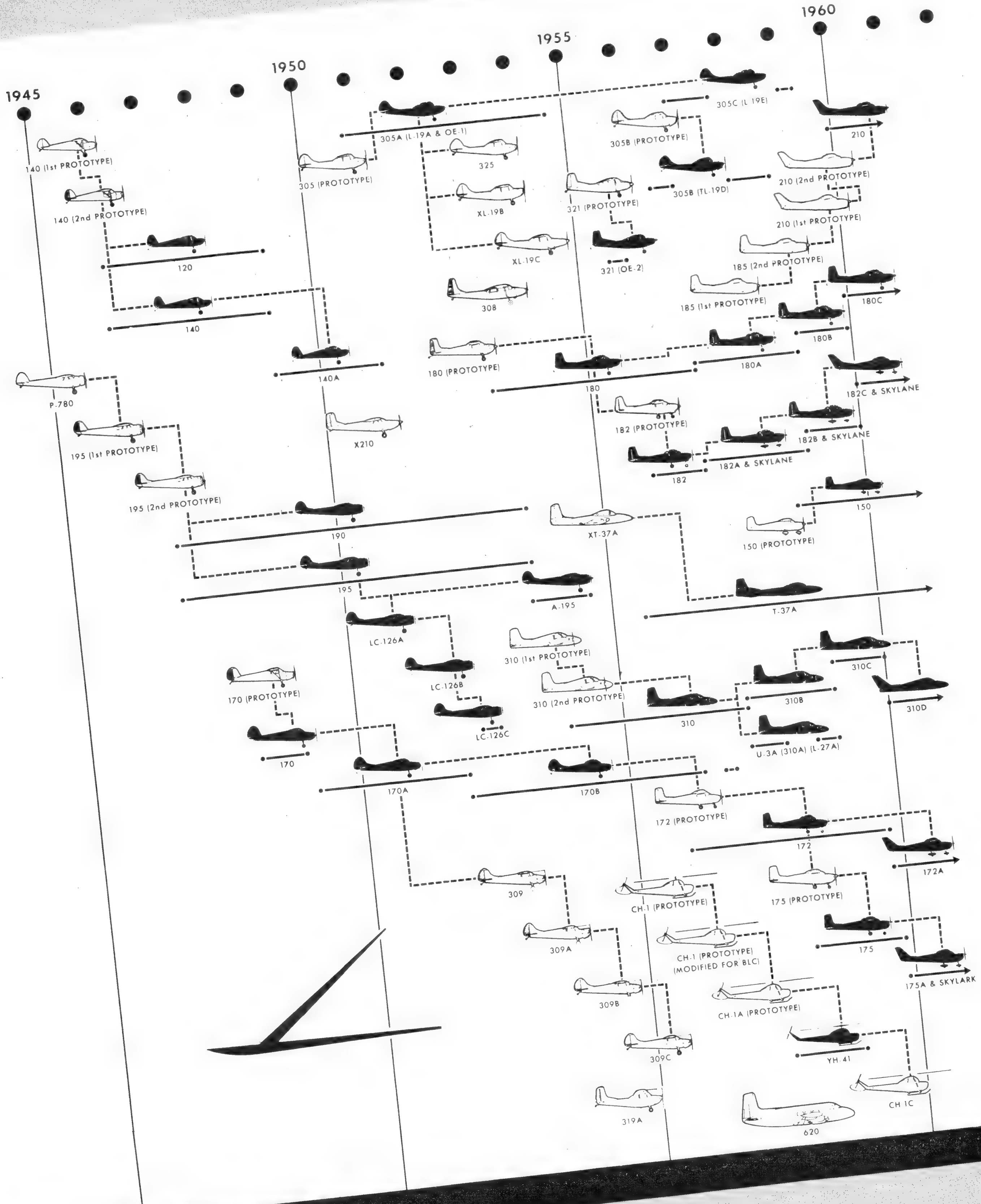
In the fall of 1916, J. J. Jones, President of the Jones Motor Company of Wichita, offered Clyde Cessna space in his factory, free of charge, if he would build a plane in the Jones plant in Wichita, Kansas. The Jones Motor Company was manufacturing an automobile called "The Jones Light Six." Mr. Jones thought that if Cessna would

(*Continued on page* 50)

First powered aircraft built in Wichita, Kan., was this 1917 Cessna (right) powered by 60 hp Anzani engine. Group is part of the Oklahoma "Beaver Boosters".

Genealogy of Aircraft




1945
1950
1955
1960
140 (1st PROTOTYPE)
140 (2nd PROTOTYPE)
120
140
140A
P-780
195 (1st PROTOTYPE)
195 (2nd PROTOTYPE)
190
195
X210
305 (PROTOTYPE)
305A (L-19A & OE-1)
325
XL-19B
XL-19C
308
180 (PROTOTYPE)
180
321 (PROTOTYPE)
321 (OE-2)
305B (PROTOTYPE)
305B (TL-19D)
305C (L-19E)
210
210 (2nd PROTOTYPE)
210 (1st PROTOTYPE)
185 (2nd PROTOTYPE)
185 (1st PROTOTYPE)
180C
180B
180A
182C & SKYLANE
182B & SKYLANE
182 (PROTOTYPE)
182A & SKYLANE
182
150
150 (PROTOTYPE)
XT-37A
T-37A
A-195
LC-126A
LC-126B
LC-126C
310 (1st PROTOTYPE)
310 (2nd PROTOTYPE)
310
310B
310C
310D
U-3A (310A) (L-27A)
170 (PROTOTYPE)
170
170A
170B
172 (PROTOTYPE)
172
172A
309
309A
309B
309C
319A
CH-1 (PROTOTYPE)
CH-1 (PROTOTYPE) (MODIFIED FOR BLC)
CH-1A (PROTOTYPE)
YH-41
CH-1C
620
175 (PROTOTYPE)
175
175A & SKYLARK

Cessna

use his shop, it would help advertise the car he was making. Mr. Cessna built three airplanes during 1917 at the Jones facilities in Wichita. These were the first powered aircraft to be manufactured in Wichita, which later was to become the commercial light plane capital of the world. His second airplane was made for a rival hedgehopper. The third airplane Clyde built at the Jones Motor Company was called the Cessna "Comet." This plane incorporated an enclosed cockpit for the pilot and was one of the earliest attempts, in this country, to shelter the pilot.

Since 1919, various airplane builders had invited Mr. Cessna to join with them. He turned them all down. But in 1925, Walter Beech, who had been a hedgehopper himself, but who later had been with the Swallow Airplane Company of Wichita, proposed that Cessna join with him in organizing the Travelair Company. As a further inducement, Mr. Cessna was offered the presidency. Lloyd Stearman, who was later to head the Stearman Airplane Company, was engineer for the company and had developed a biplane. Mr. Cessna had always been partial to monoplanes, but he went along, putting $5,000 into the new company.

Clyde Cessna stayed with the Travelair Company until 1927 when he dropped out of Travelair to once again start building aircraft of his own. His first airplane after leaving Travelair was a full cantilever wing, four-place, monoplane powered with an Anzani 110 h.p. engine. His plane was very radical in that it was one of the first attempts to build a light plane without the use of wing struts. The little airplane more than met his expectations and he interested Victor H. Roos of Omaha to join him in forming "The Cessna-Roos Aircraft Corporation." This company was formed in August, 1927. A few months later Mr. Roos sold out his interest in the company to Clyde and the Cessna Aircraft Company was formed on December 31, 1927 with Clyde Cessna as its President.

The company's first production aircraft were called the "A" series. This series consisted of a basic four-place, full cantilever, high wing airplane. It was offered in five engine combinations. The models were called AA, AW, AS, AC, and AF depending upon whether the airplane was equipped with an Anzani, Warner, Siemans Halske, Comet, or Floco engine, respectively.

As is the case today, Cessna was swayed by the ever increasing demand for more horsepower and, late in 1928, built and sold the Cessna Model BW which was an "A" series airframe powered with a 220 h.p. Wright J-5 engine.

In 1929, Cessna came out with the DC-6 series aircraft which were higher gross weight and performance airplanes incorporating the full cantilever high wing. These aircraft were designated DC-6A and DC-6B and were powered with 330 h.p. and 250 h.p. engines respectively.

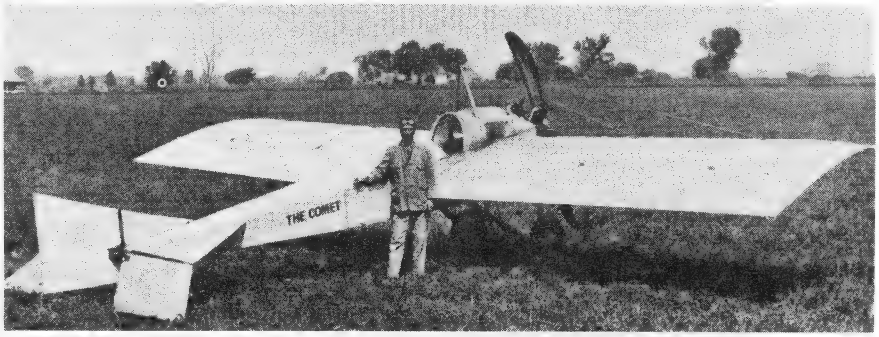
Production reached 30 a month during 1929. Business was good and Cessna was dreaming of even larger airplanes.

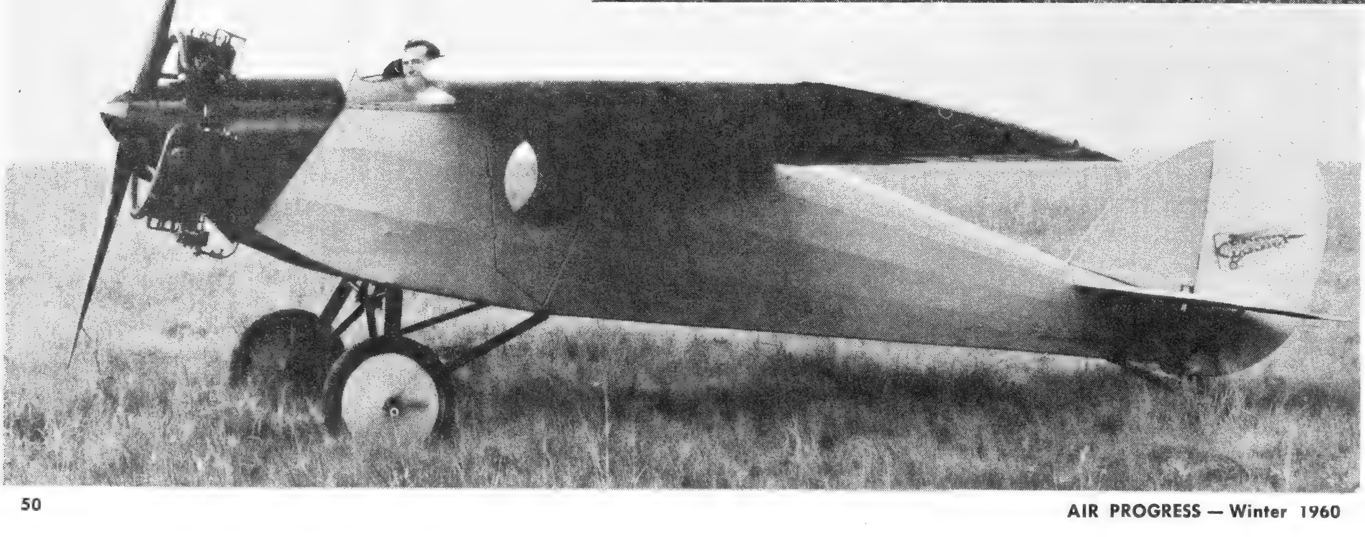
The CW-6 airplane was designed and one of these aircraft was built. The airplane incorporated the full cantilever wing and was capable of holding 6 people. It was powered with a 300 h.p. Wright J-6 engine. This airplane was down in Mexico at the time a revolution broke out. A Lt. Col. in the Air Force confiscated the airplane for the Mexican government and it was used to bomb the rebels from the air. At the end of the successful defeat of the rebels, the officer who confiscated the airplane became General of the Air Force. After the revolution, the airplane was purchased from Cessna by the Mexican Government.

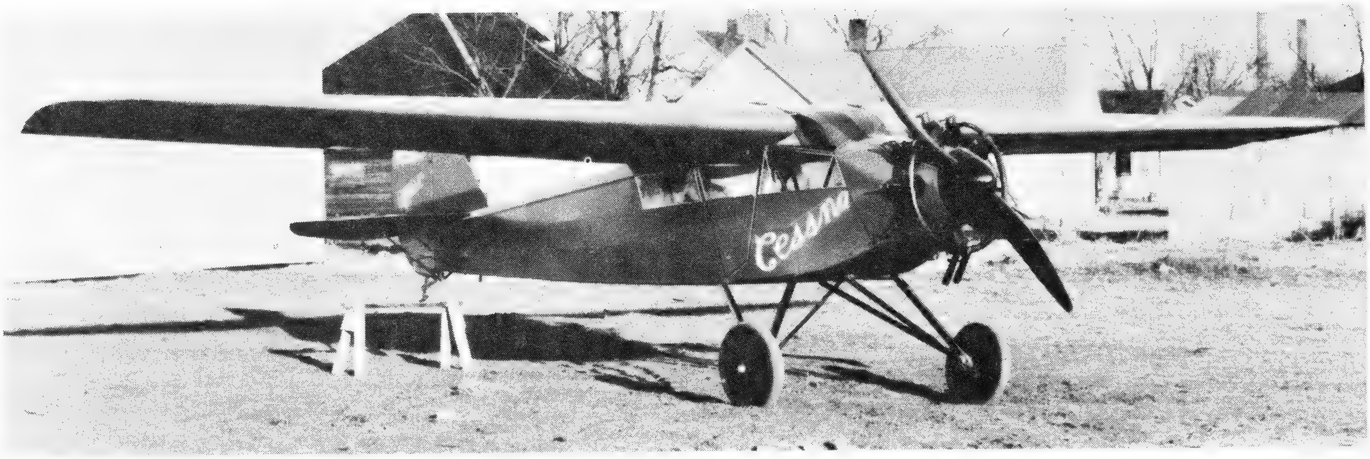
Then came the depression, and Cessna struggled to remain in business. The powered aircraft market had all but disappeared; Cessna turned to the manufacture of primary training gliders in 1930 to keep the doors open. Approximately 300 primary training gliders were built during 1930. Also, during 1929 and 1930 Clyde designed and built an endurance racer, a Cirrus Derby Racer, and a Warner-powered, mid-wing, fixed-gear racer. These aircraft were made on special order from racing pilots.

During 1931, 1932, and 1933, the manufacturing activities of Cessna were restricted to the designing and building of airplanes for special order. These ships were mostly racing aircraft. A mid-wing, retractable gear, racing monoplane called the CR-2 was designed and built by Cessna in 1932 and was flown by Roy Liggett in the American Air Races in 1932. In 1933, a shoulder wing version of the

Cessna's first attempt to enclose the cabin was with his 1917 "Comet" which used 60 hp Anzani (right). His first full cantilever wing was prototype "A" model, below. Made in 1927 this still had an Anzani for power but it boasted 110 horsepower; 4 passengers.

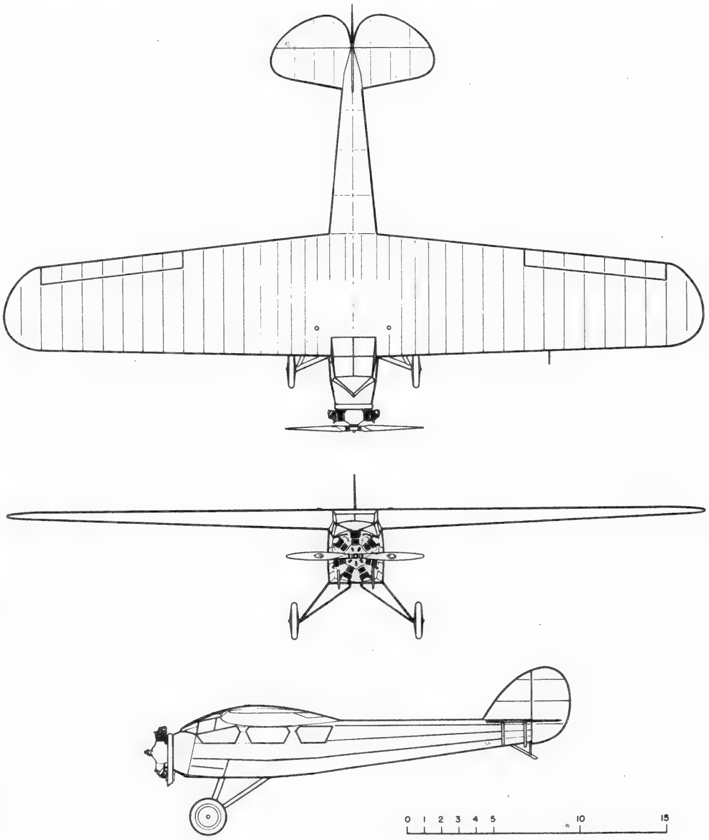






Third in "A" series (above). Powerplants were: AW—125 hp Warner Scarab; AA—120 hp Anzani; AS—125 hp Siemans-Halske; AC—130 hp Comet; AF—150 hp Axelson Floco.

AW (below) cruised at 110 mph, maximum speed 130, landed at 42. Cruising range 650 miles. Wing airfoil was modified M-12. Wing dihedral, incidence—zero.



CR-2 was built with an enclosed cockpit and was called the CR-3. This airplane was built for Johnny Livingston, a noted racing pilot of this era. The little CR-3 won every event in which it was entered in the American Air Races of 1933.

During these same years, Eldon Cessna, who was the son of Clyde Cessna, worked side-by-side with his father. Eldon had an idea that there might be a market for a Baby Cessna of one to two place size. Therefore, in 1931, a one place, full cantilever wing airplane was designed and built by Eldon Cessna. It was powered with a 25 h.p. Cleone engine. A later model, the EC-1, followed in the same year and incorporated a 30 h.p. Aeronca engine. In 1932, Eldon Cessna designed and built the EC-2. However, the company did not proceed with the manufacture of the Baby Cessna line and these aircraft were dropped.

In 1933, a quiet, lanky boy from the wheatlands fifty miles west of Wichita and a recent graduate of the Wichita University School of Aeronautics came to work for Cessna as an engineer and test pilot. In 1936, when Cessna decided to dispose of his stock holdings and retire from the business, this same boy, Dwane L. Wallace, bought a controlling interest and became President of the company. Mr. Wallace is still President of the Cessna Aircraft Company today.

Clyde Cessna retired from aviation in 1936 and returned to his farm in Rago, Kansas. Here he spent the remainder of his life and died, at the age of 74, on November 20, 1954.

The first project Dwane Wallace undertook was a speedy high wing monoplane, the Airmaster. To raise working capital for the small company he flew in air races all over the country. The purses he won were used to pay employees and build more airplanes. It was during this time that the Airmaster flew away with the Detroit News trophy three years in a row. Production of the Airmaster reached a new Cessna high of 50 per year.

When war broke out in Europe and the Pacific, the building of light aircraft halted and Cessna geared for defense production. Twin-engine bomber trainers, gliders and numerous subcontract items flowed from the factory.

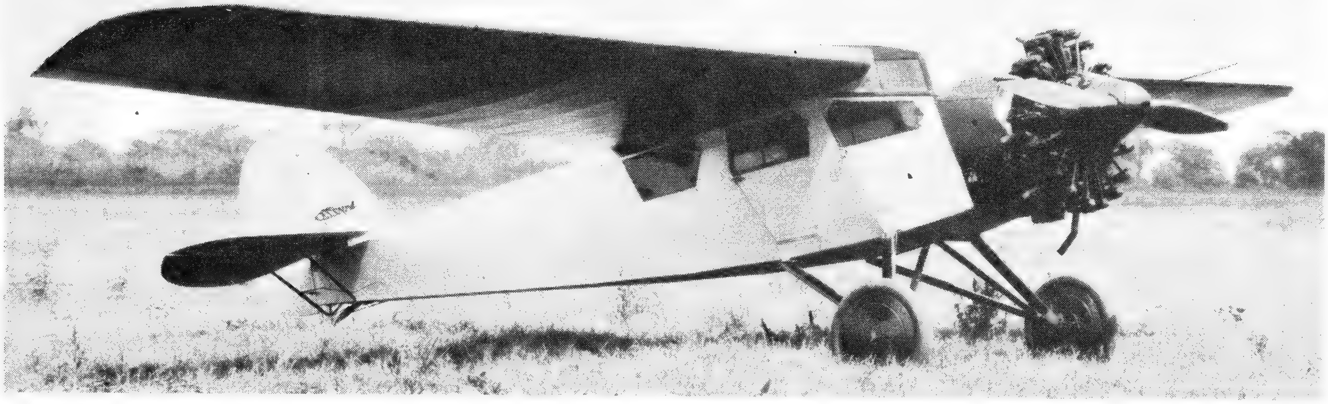
Even before World War II ended, a new era for aviation was on the horizon and new designs for flying businessmen were on Cessna's drawing boards. When the cease fire came, Cessna again turned to private aircraft and the models 120, 140, 190 and 195 became familiar as Cessna's initial contribution to the national and international postwar market. However, in planning for the future, Mr. Wallace and his management team at Cessna set as their goal in the light aircraft market the development of a line of aircraft designed to meet specific market demands.

As individual and corporate businessmen realized the airplane was a time-saving and profit-making piece of business equipment, and as sales of business aircraft surged upward, faster and more comfortable models were added including the twin-engine Model 310.

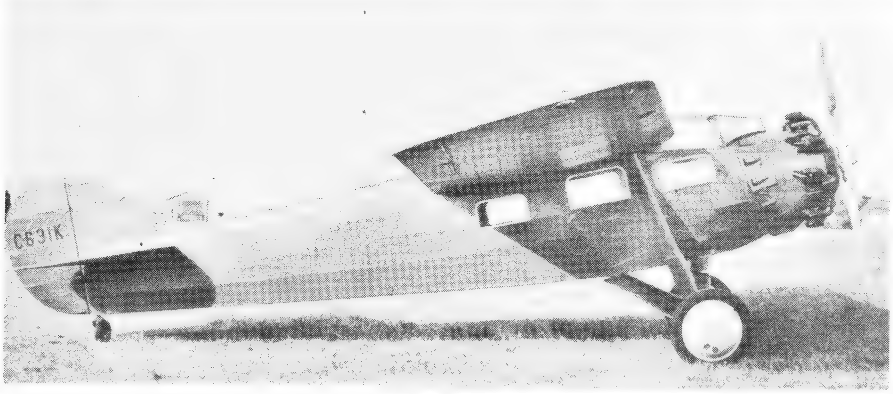
Korea brought defense production back to the nation and Cessna stepped up to develop a liaison-observation airplane known as the L-19 Bird Dog, which saw immediate action overseas.

In 1956, the company broke ground for another facility, the Wallace Plant. Its Prospect plant also expanded and the joint facilities of these two plants were used to develop the T-37, a twin jet trainer for the Air Force, a high performance helicopter and the four-place jet, the model 407. The 407, a sleek, low-winged pressurized personnel transport incorporates the most modern developments of the jet age. It further assures that Cessna intends to keep pace with the future. The Pawnee Road plant, which is the principal center of commercial airplane production, has continued to expand at an accelerated rate to handle the demands of the personal airplane market.

Today Cessna is booming in commercial and military business. Commercial aircraft production consists of nine business airplanes ranging in price from $7,250 to $59,950.

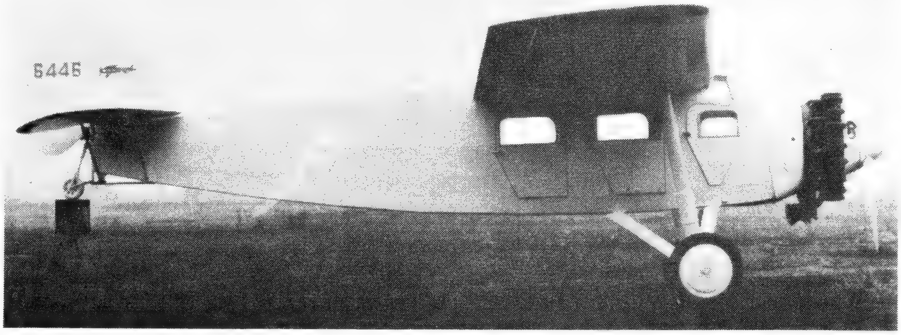


Model BW (above) 1928 three-place cabin monoplane had Wright J-5 225 hp mill, was fabric covered. Thirteen constructed.

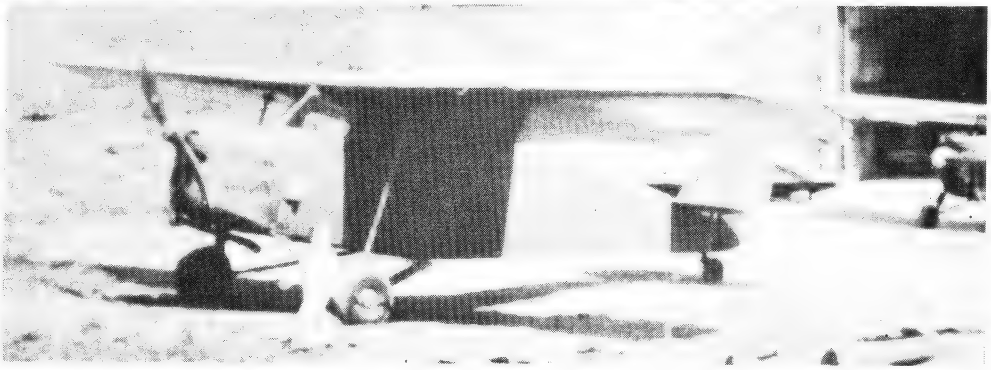


DC-6B (no relation to much later, and vastly bigger Douglas transports!) at left, was 4-placer with Wright R-760 250 hp engine. Sold for $10,000; 25 built from 1929-1934. Army purchased 4 in 1942 from commercial owners designating it UC-77A. DC-6A/UC-77 was similar but had 330 hp Wright.

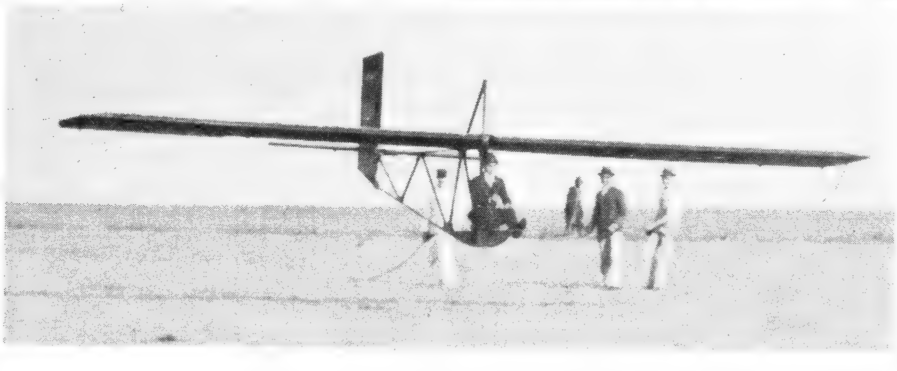
CW-6 (right) was turned out in 1929 as 6-placer with Wright J-5 225 hp engine. Note "C" for Cessna, "W" for Wright, and "6" for capacity.



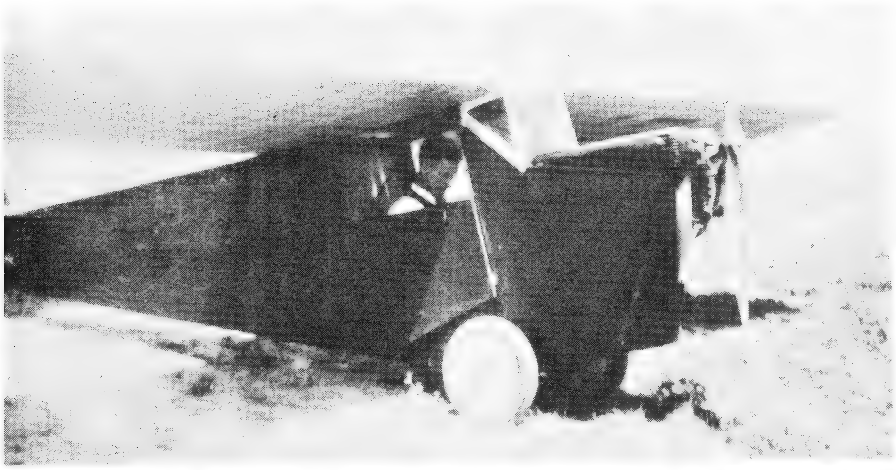
Two place cabin mono (right) of 1929 —and that sounds like a busy year!— was FC-1; Cirrus Ensign inverted 95 hp engine.



Three hundred fabric covered 1-place primary training gliders like the one below were built in 1930. This was labeled the CG-2.

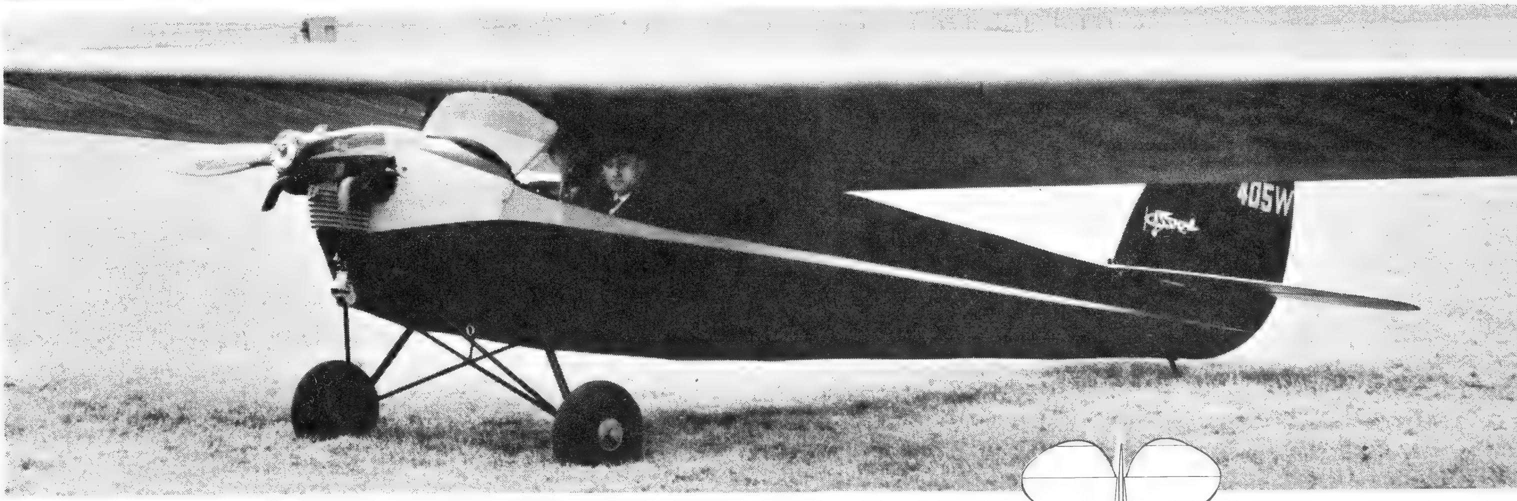


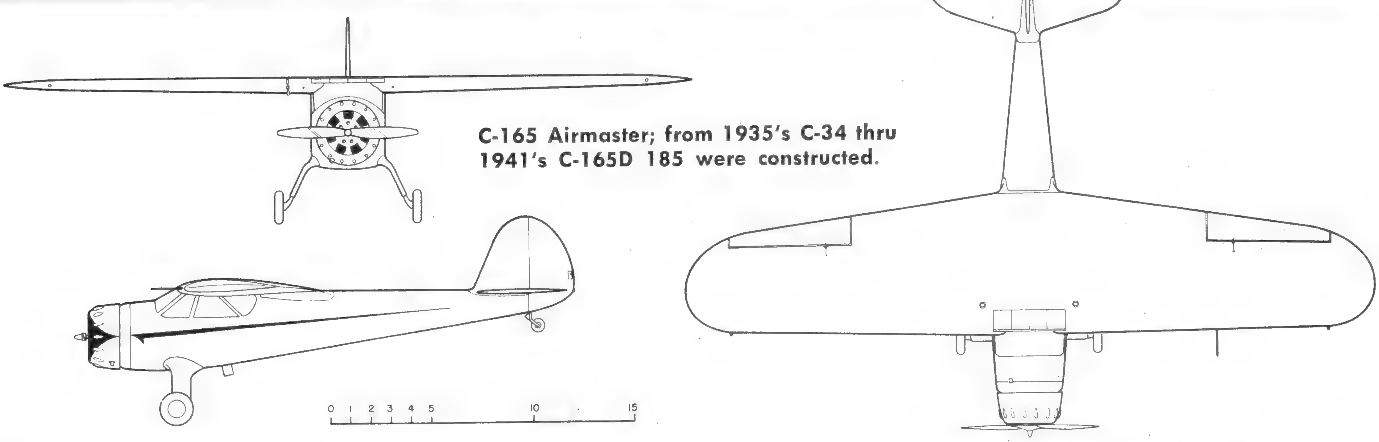
RIGHT—Four place C-37 of 1937 had 145 hp Warner Super Scarab. Army bought used one in 1942 as UC-77C. Known as the "Airmaster", 46 of these were made. Fabric covered, sold for $5,490. Can you identify the rising movie star-sportsman pilot?



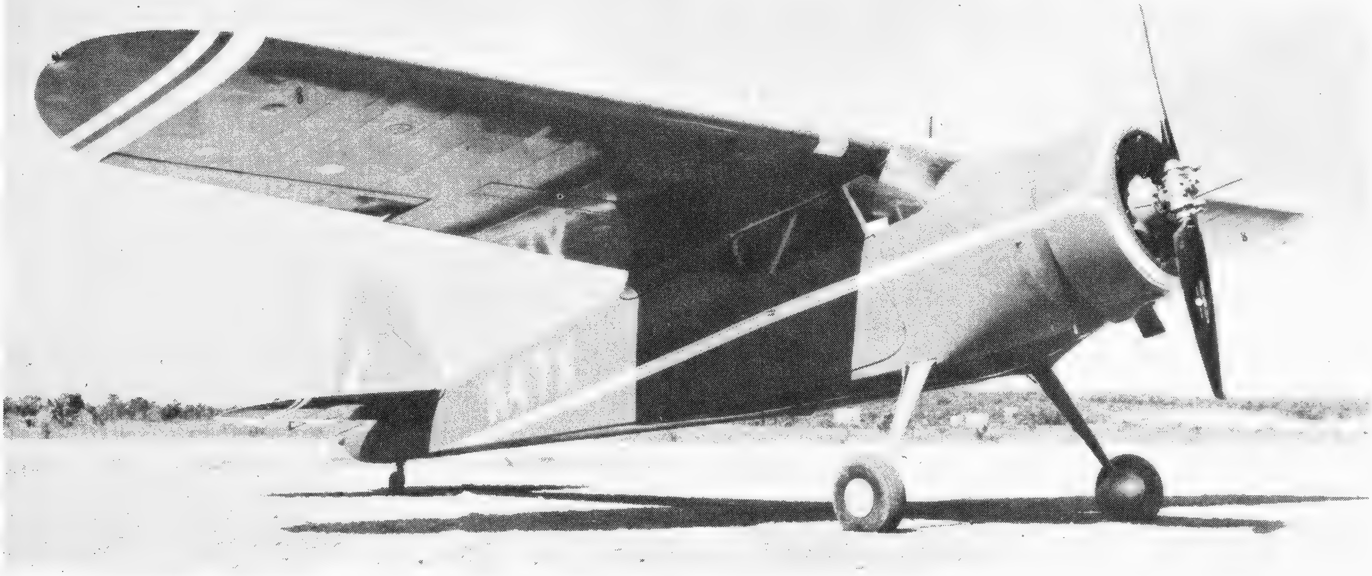
Baby Cessna, left, 1-place, Cleone 26 hp motor. Clyde's son Eldon evolved the Baby as minumum-powered aircraft for pleasure flying after testing a CG-2 glider equipped with a 25 hp engine. Second prototype built in 1931 was the EC-1, had 30 hp Aeronca engine. In 1932 2-place EC-2 was turned out with 30 hp Aeronca power.

EC-2, below was advanced plane for its day. Because of depression aircraft market dwindled and the company did not feel it would warrant volume production. The little ship was all but forgotten until a few years ago when its records were uncovered in firm's historical files.

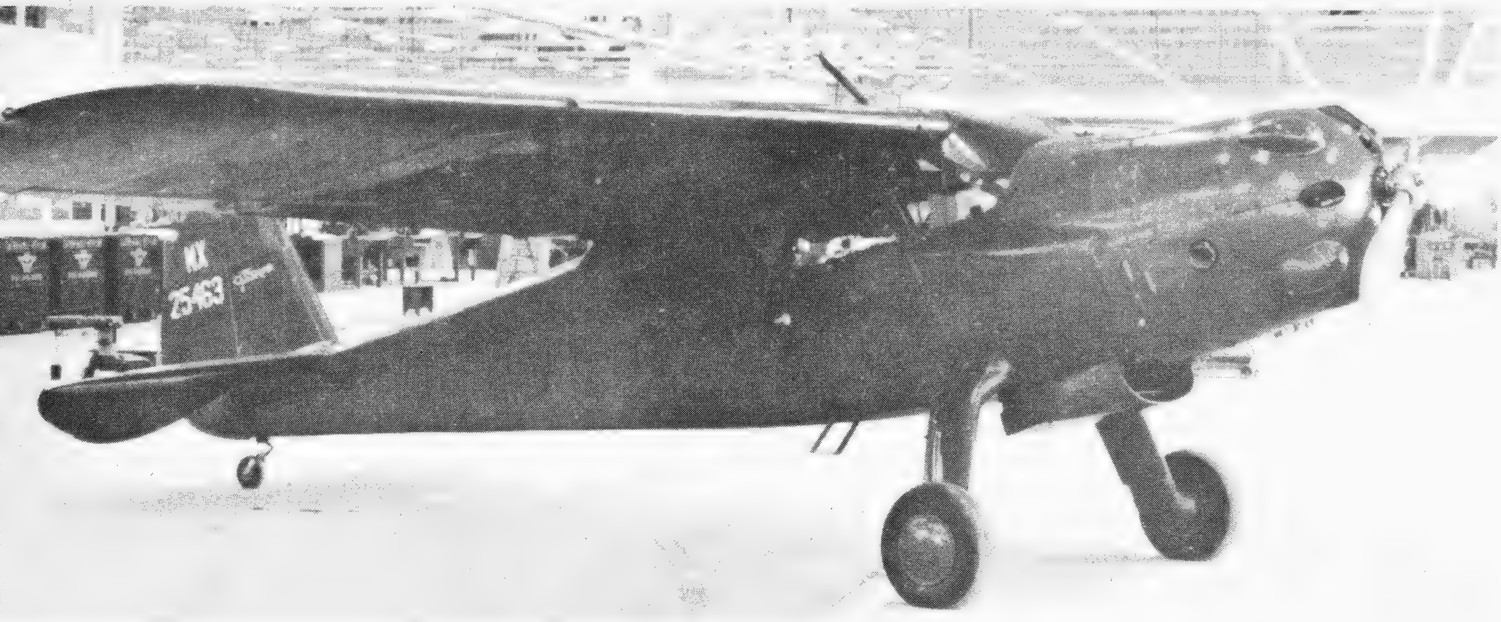




C-165 Airmaster; from 1935's C-34 thru 1941's C-165D 185 were constructed.

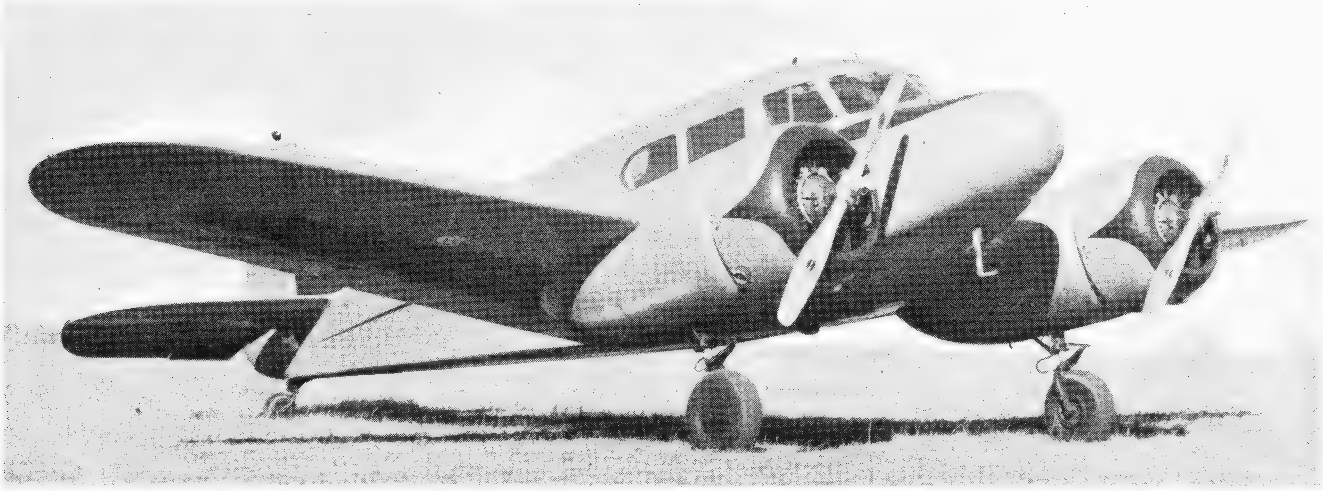


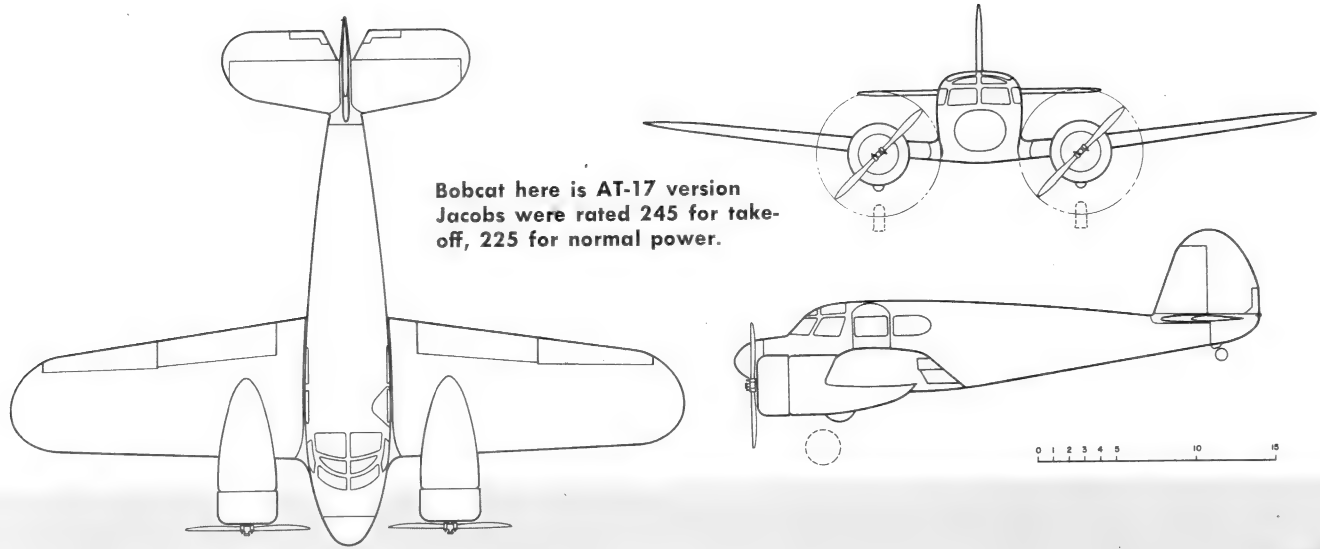
Modified C-165 Airmaster (above). These ranged from the 1935 C-34 with 145 hp Warner Super Scarab selling at $4,995 to the 1941 C-165 with 165 WSS power for $9,825. Wing airfoil was NACA 2412; zero wing dihedral. Fixed pitch 7 foot metal prop. Fuel filler caps indicated (preceding page) on wing top near fuselage.



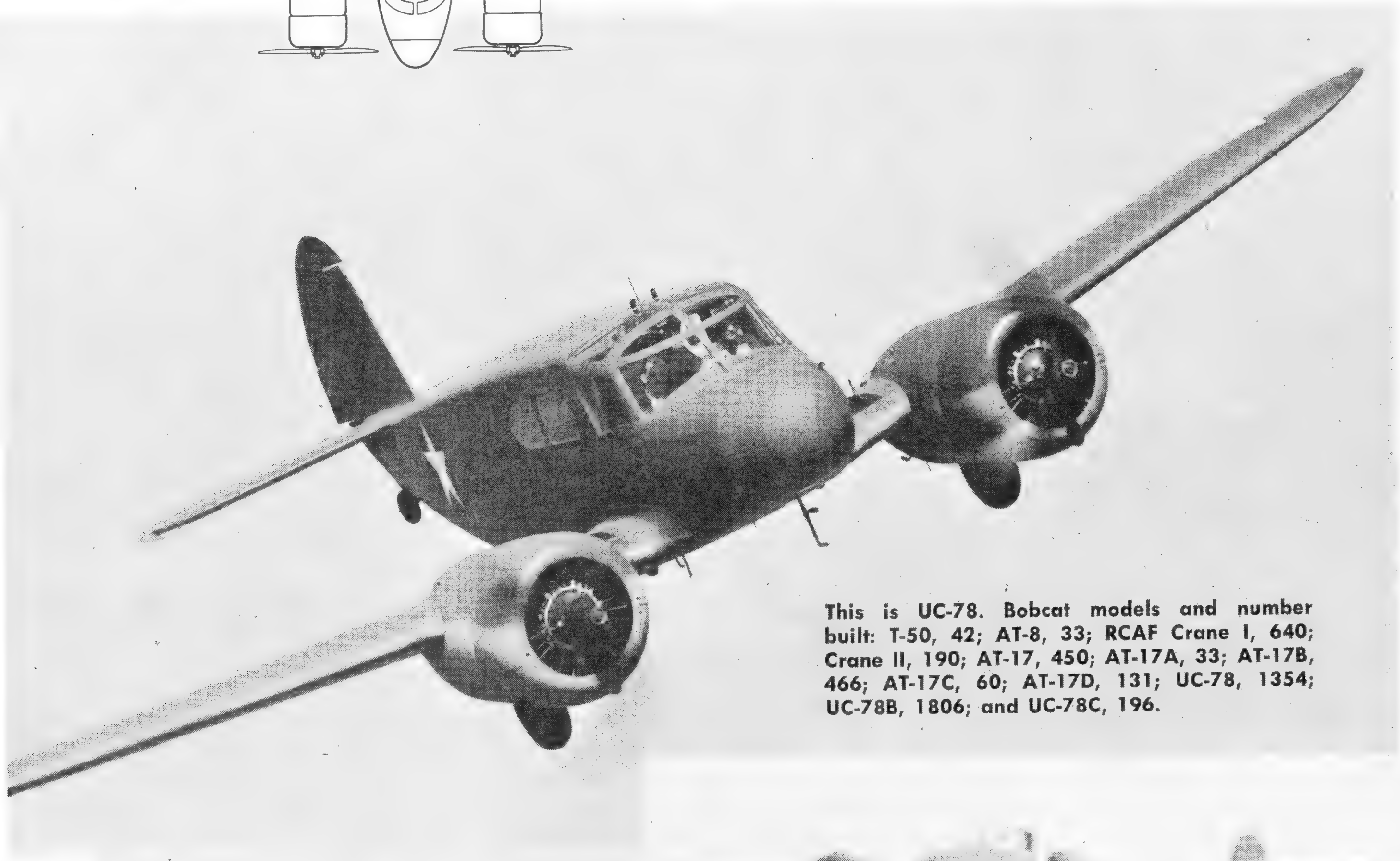
Collector's item above is "General Motors Special" made in 1941. Power plant was experimental G.M. liquid cooled, 175 horsepower, 2 cycle, 4 cylinder.

T-50 "Bobcat", below, was Air Force AT-8. Built in 1940 as 5-place twin with Jacobs R-755-9 245 hp engines. Fabric covered of steel tubing and wood construction.



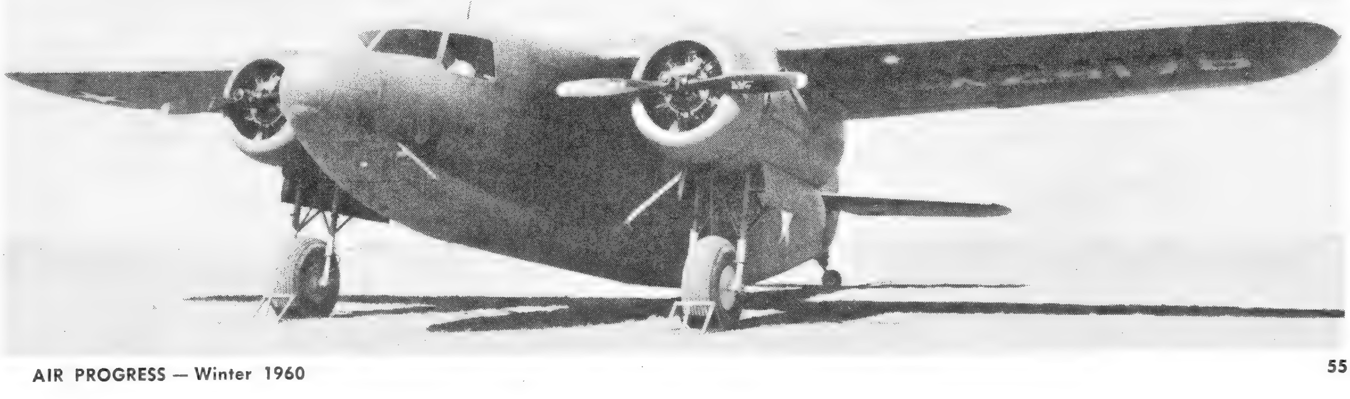


Bobcat here is AT-17 version Jacobs were rated 245 for take-off, 225 for normal power.

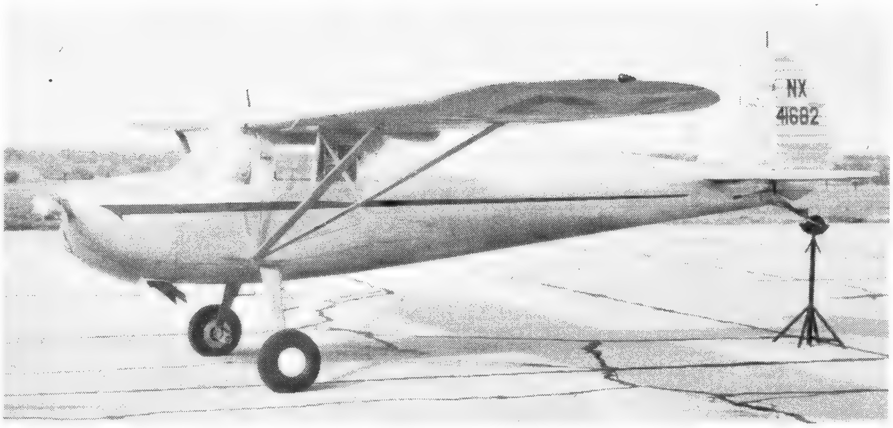


This is UC-78. Bobcat models and number built: T-50, 42; AT-8, 33; RCAF Crane I, 640; Crane II, 190; AT-17, 450; AT-17A, 33; AT-17B, 466; AT-17C, 60; AT-17D, 131; UC-78, 1354; UC-78B, 1806; and UC-78C, 196.

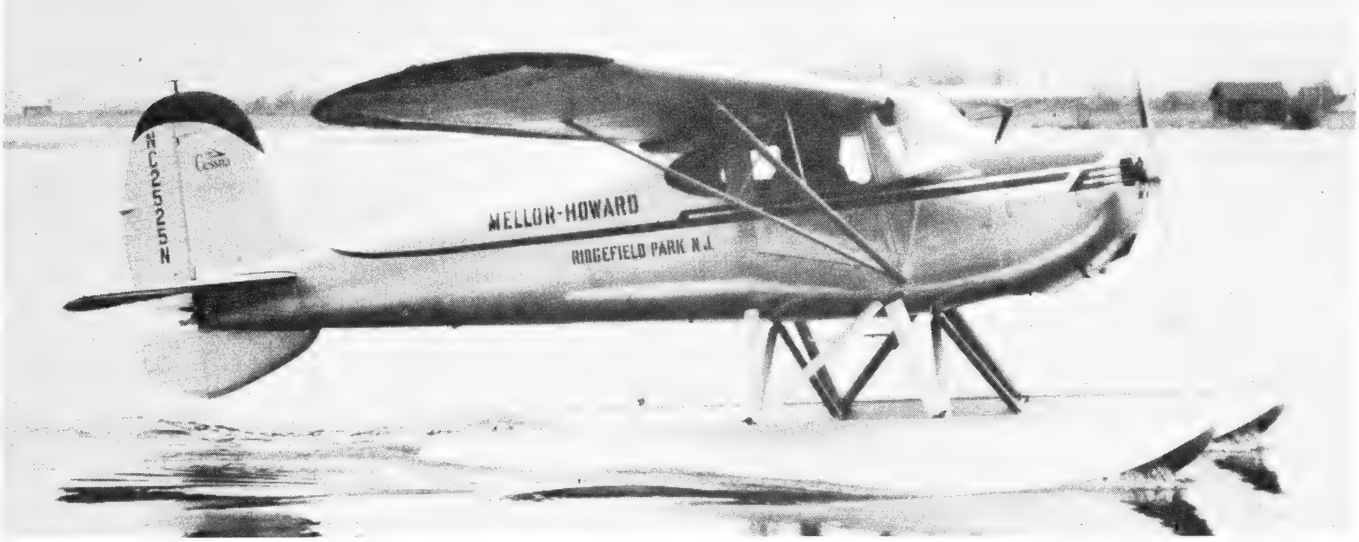
P-10, right was 2-place side-by-side advanced bomber trainer with Jacobs 330 hp engines; 1 built. P-260 (below) cargo job with Pratt & Whitney R-134-AN-2 600 hp engines was made in 1942. Air Force C-106A was same except for 3-blade props.

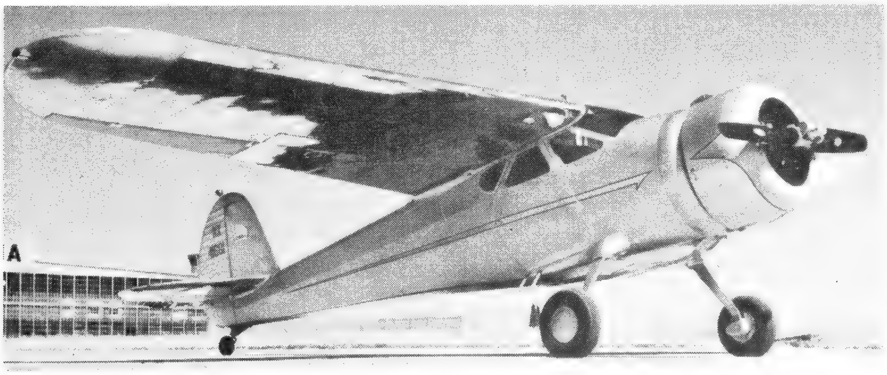


Post-war prototype for "140" series, right. This 1945 craft used 85 hp Continental C-85-12F engine. "120" was made from 1946 to Aug. 1950, in that period 2164 were turned out.



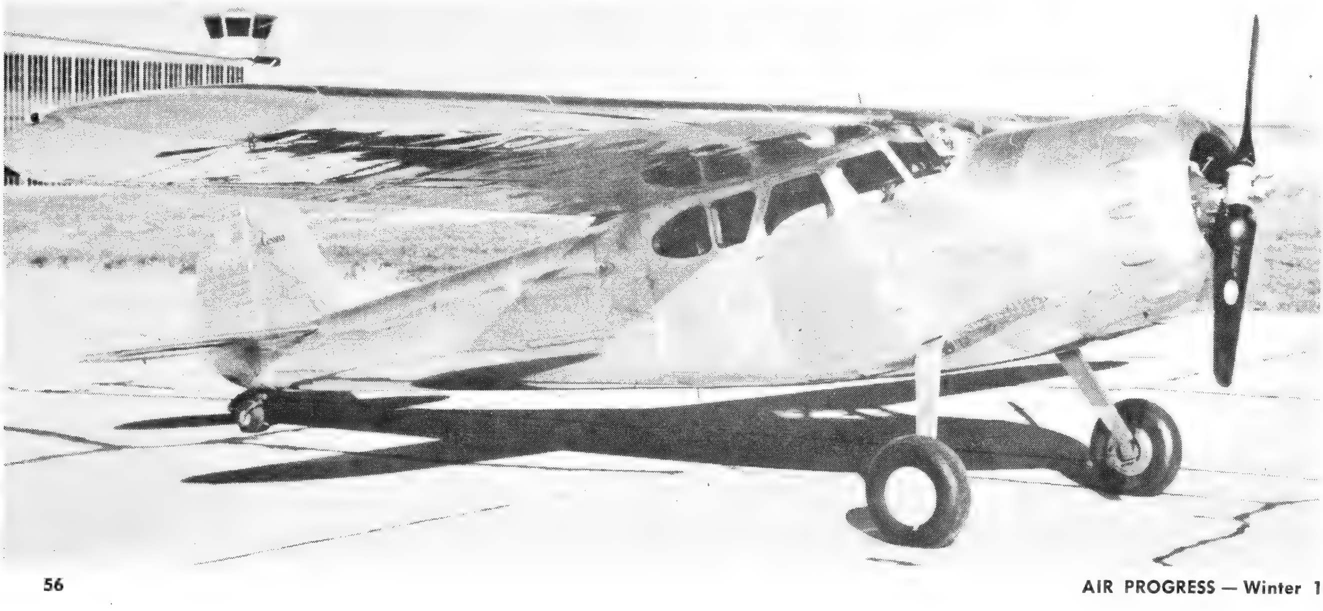
"120" (below) on floats. 120 and 140's had semi cantilever fabric covered wing; 140A used metal covered wing. Two-place 140 and 140A production totals were 4881 and 521, respectively.



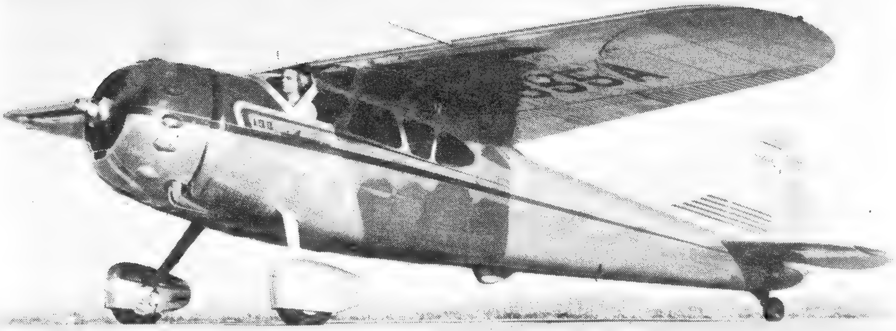


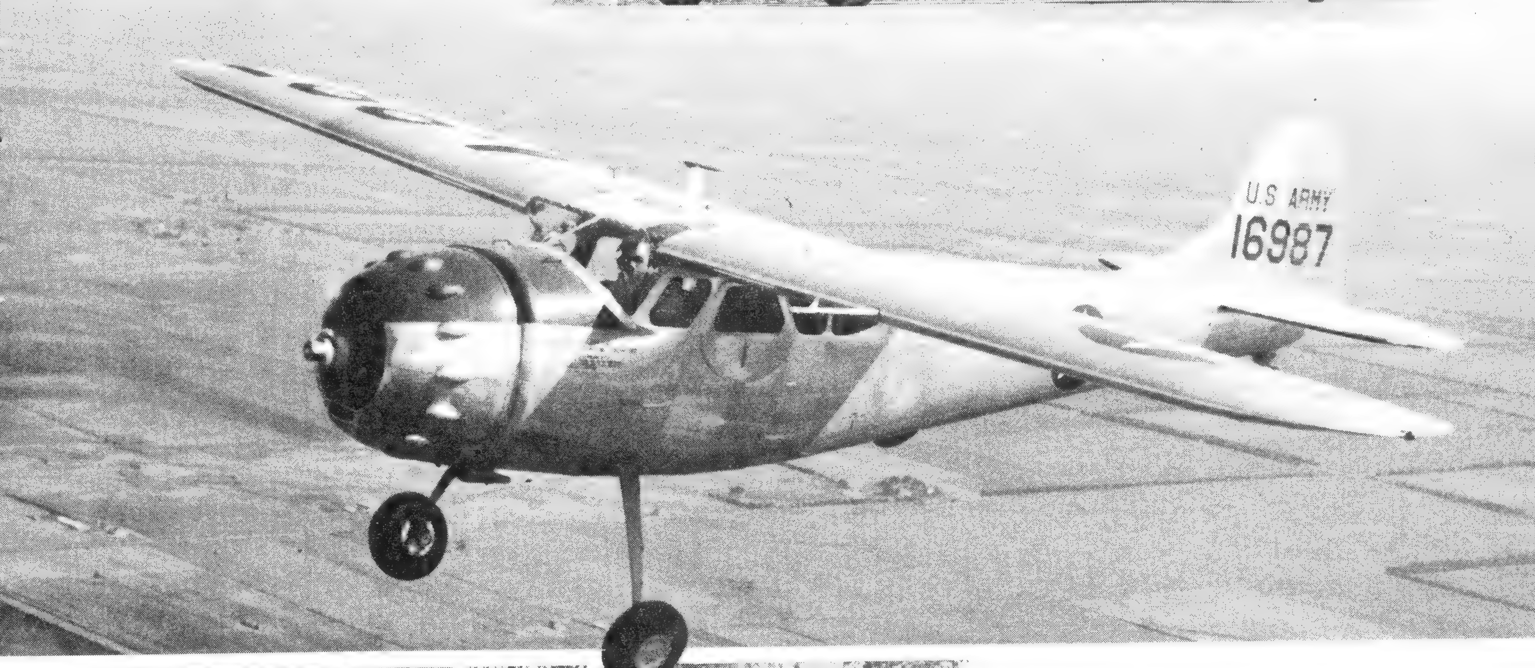
P-780 of 1944 (left) was 5-place offering powered by 245 hp Jacobs R-755-9 engine; this led to the 195 series.

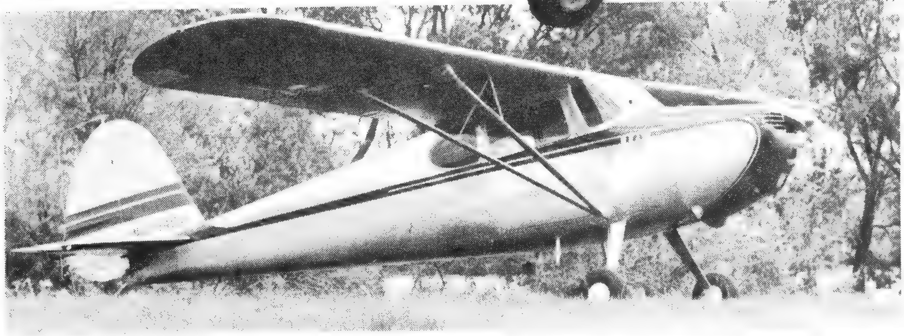
Prototype (below) for the "195" series made its debut in 1945. This 5-place job used Jacobs R-755-A2 300 hp mill. Production was: 195, 446; 195A, 211; 195B, 115; A195, 6; A195B, 94; USAF's LC-126A, 15; LC-126B, 5; LC-126C, 63.



The "190" series (right) started out in 1947 and continued to 1953. Power was 240 hp Continental W670; completely metal covered. Sold for $16,500; 233 built.

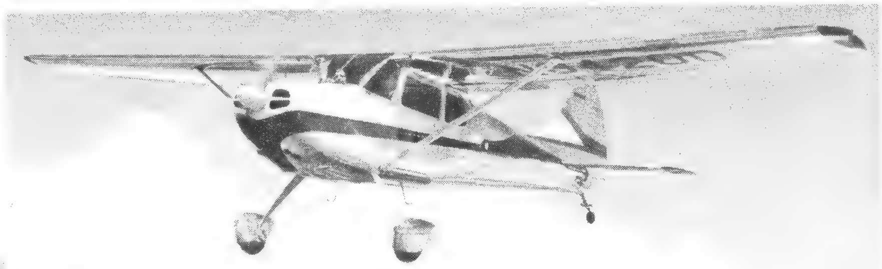


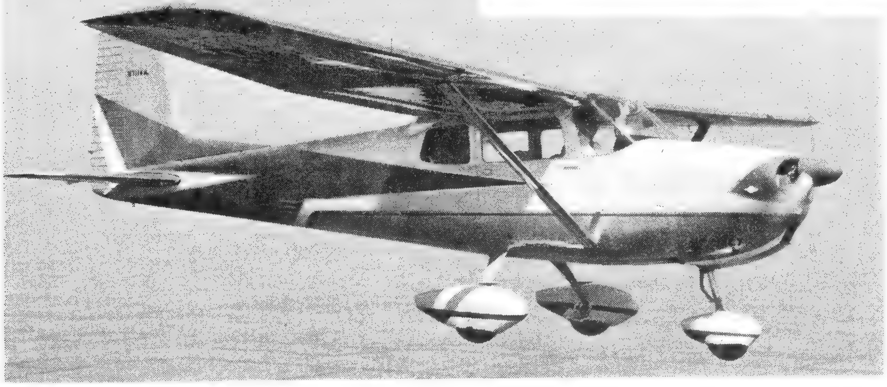




LC-126C of 1952, above. These service aircraft used Jacobs R-755-A2 300 hp engines. They were procured as follows: LC-126A, USAF-1950, 15; LC-126B, National Guard-1951, 5; LC-126C, Army-1952, 63.

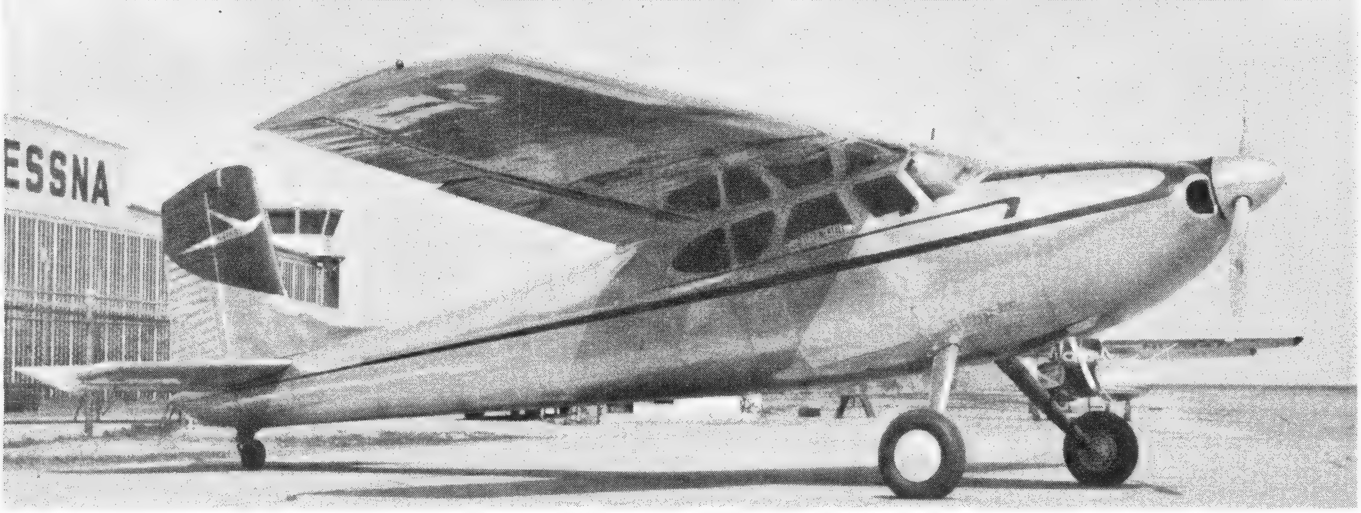
"170" of 1948 (above) was strut braced job with fabric covered wings over aluminum structure. Sold for $5,475. The 4-placer used a 145 hp Continental C-145-2. 729 170's made.

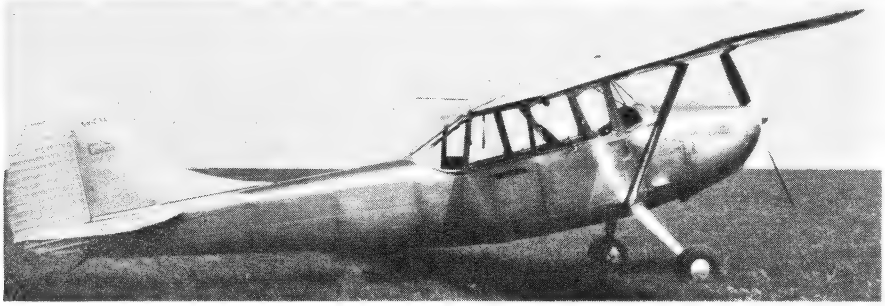




"170B" (above) was similar to "A" except it used Continental 0-300A engine instead of the A's C-145-2. 2903 B's were built from 1952 to '57; 1538 A's turned out from 1949 thru '51.

Now we get nearer present day design. "175" (left) is 4-place job that sold for $11,250. 1237 were constructed with Continental GO-300A 175 hp engine from 1958 thru 1959.

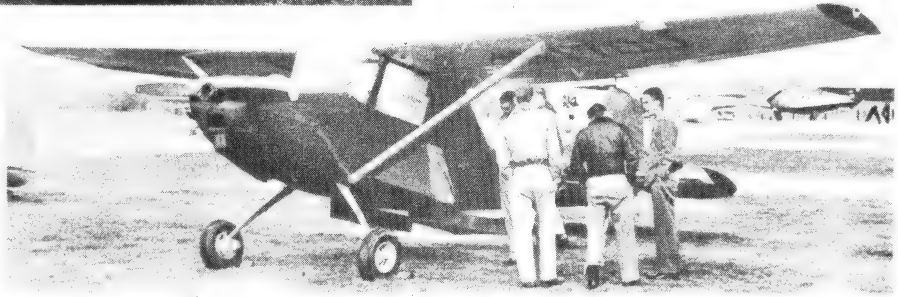


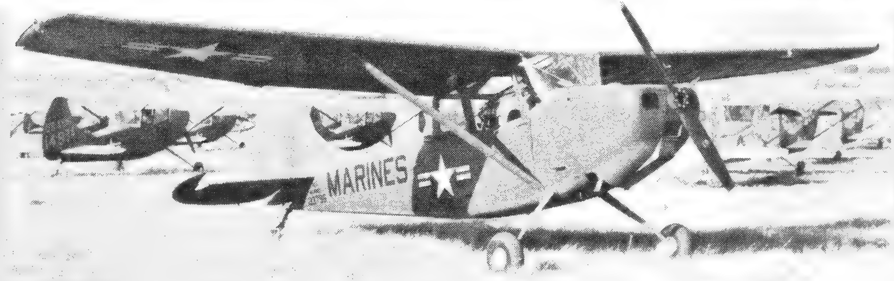


X-210 was forerunner to a current series of Cessna planes. X-job (above) appeared in 1950. Five placer was powered by Continental GO-470 240 hp engine.

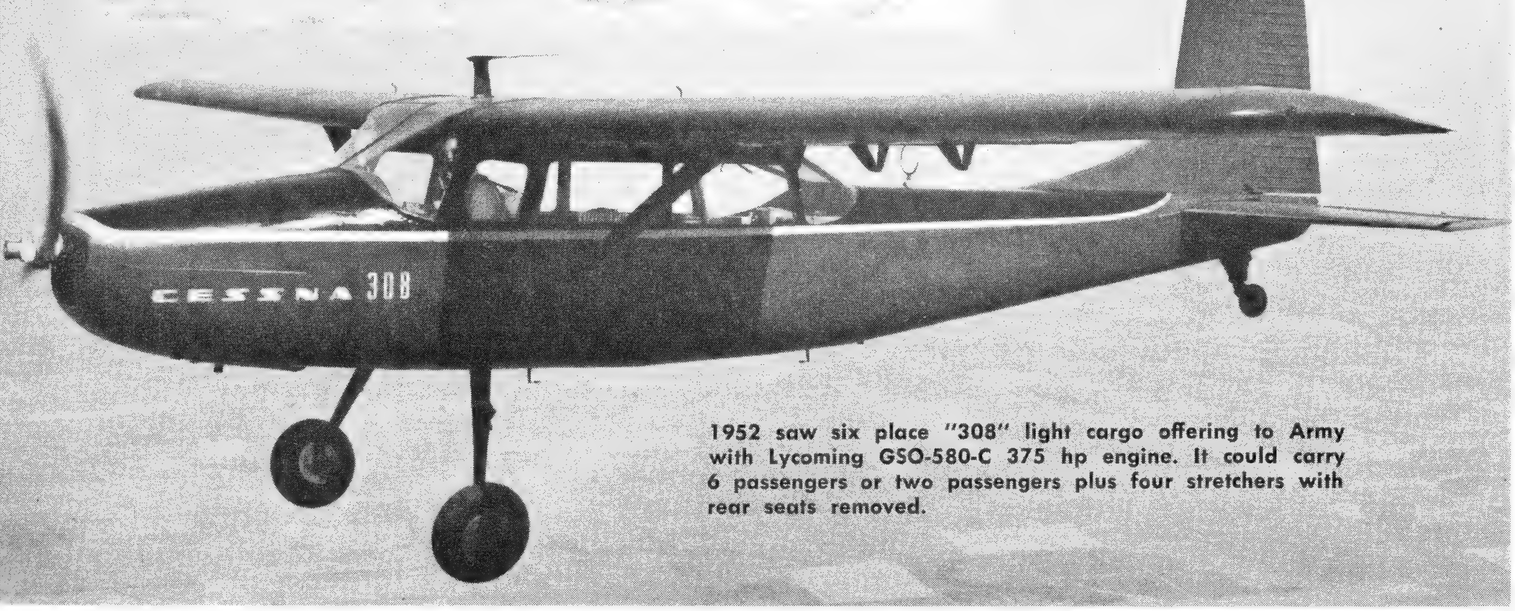
Beginning of L-19 aircraft was "305" unveiled in 1950. Two place job had Continental O-470-11 213 horsepower engine (left).

Cessna 325 (right) was modified L-19 used for crop spraying and dusting, with 6:50x10 tires, 230 hp Continental 0-470-K engine, constant speed prop. Three of these were produced and delivered to customers who added their own spray equipment. Price, $12,750.

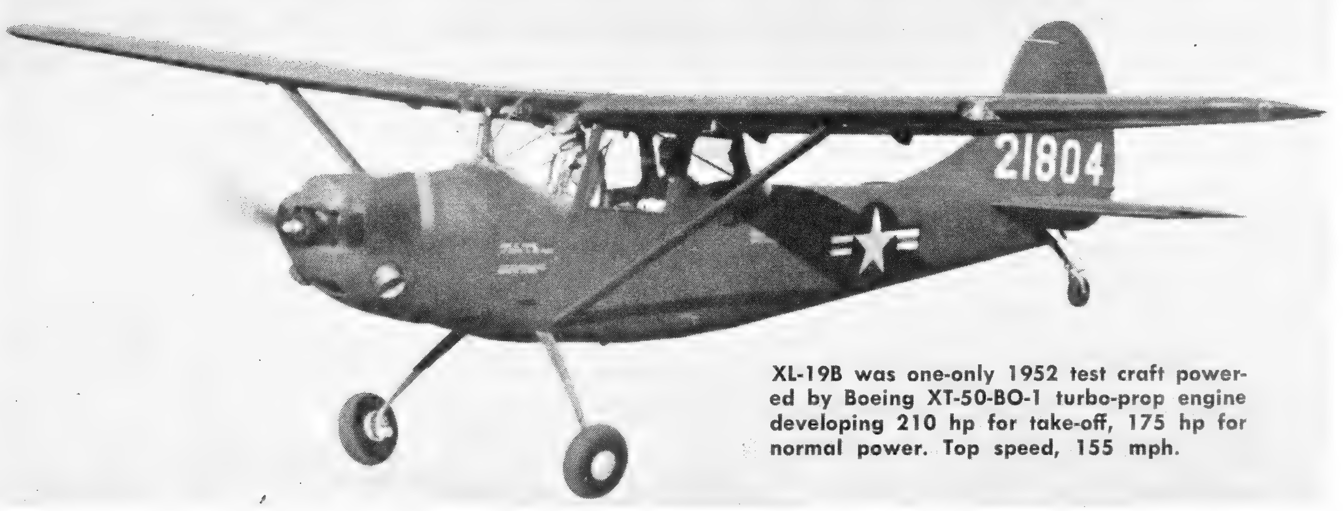




OE-1 (left) procured by Navy was same as 305A/L-19A Bird Dog used by Army; power was Continental 0-470-11 213 hp. Total built to date, all types, 3,276.



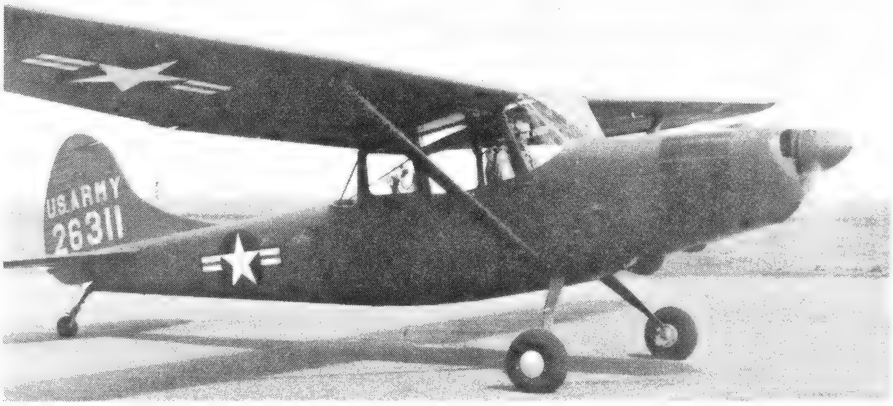
1952 saw six place "308" light cargo offering to Army with Lycoming GSO-580-C 375 hp engine. It could carry 6 passengers or two passengers plus four stretchers with rear seats removed.

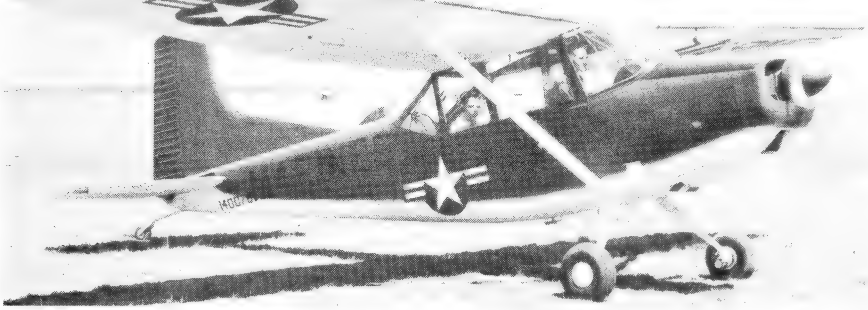


XL-19B was one-only 1952 test craft powered by Boeing XT-50-BO-1 turbo-prop engine developing 210 hp for take-off, 175 hp for normal power. Top speed, 155 mph.

XL-19C (right) flew with Continental-Turbomeca Artouste I, (model XT-51-T-1) turbo-prop engine developing 280 hp at take-off, 230 hp for normal power. Top speed was 178 mph; climb 168′/min.

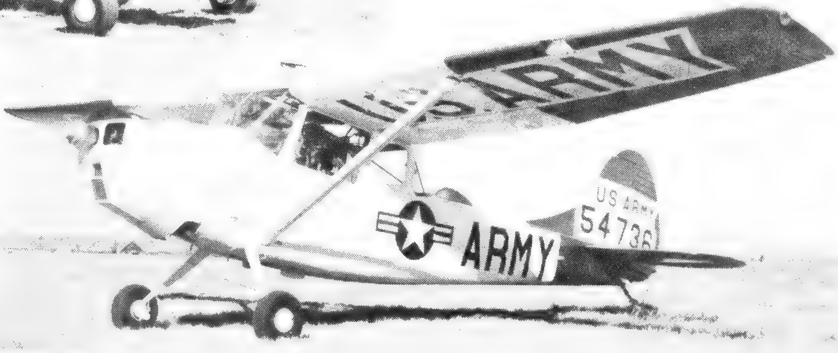
Cessna's "321" (below) was Navy OE-2 of 1955; 25 made. Continental 0-470-2 6-cylinder horizontally opposed supercharged engine provided 265 hp for take-off, 250 for normal power.

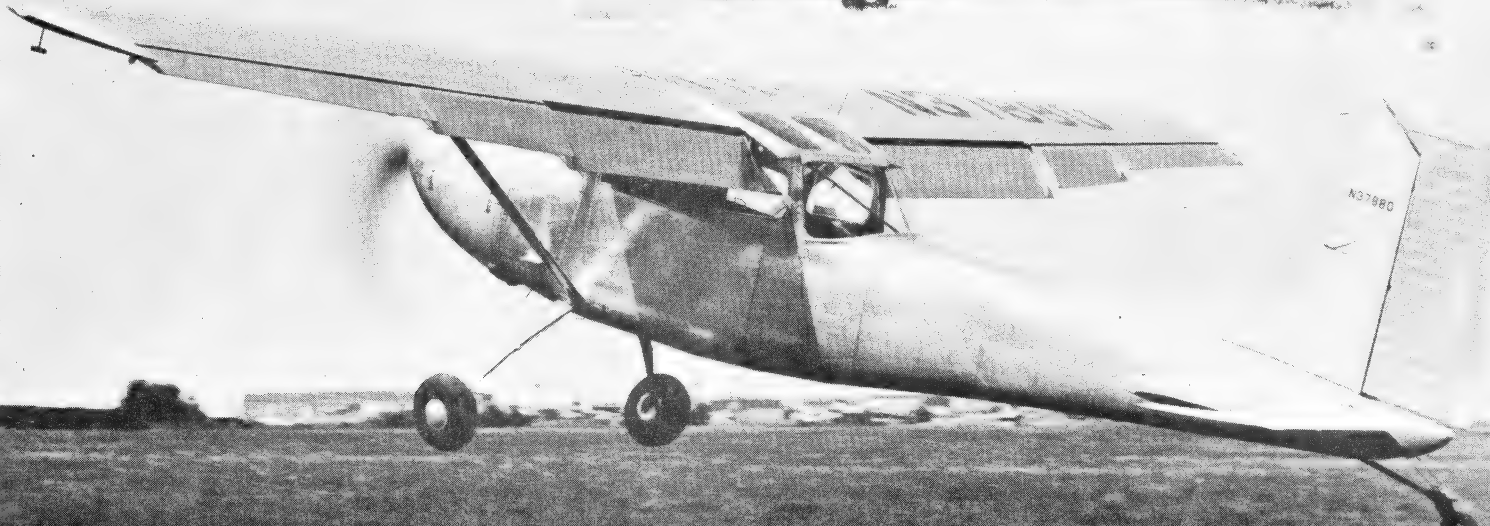


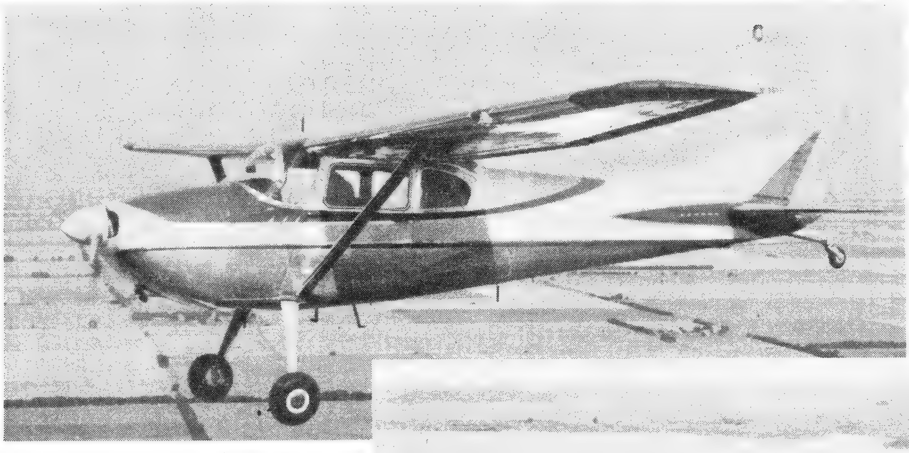


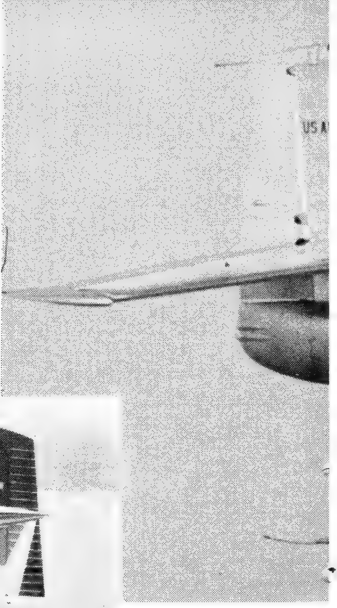
TL-19D (below) was Army version of 305B Bird Dog. 310 turned out during 1956 and 1958. Cruises at 104 mph, tops 133 with 213 hp Continental 0-470-15 rated at 190 hp for normal power.

Boundary layer research craft was 319A (below). Built in 1953, used 225 hp Continental 0-470-2-104-27X engine.





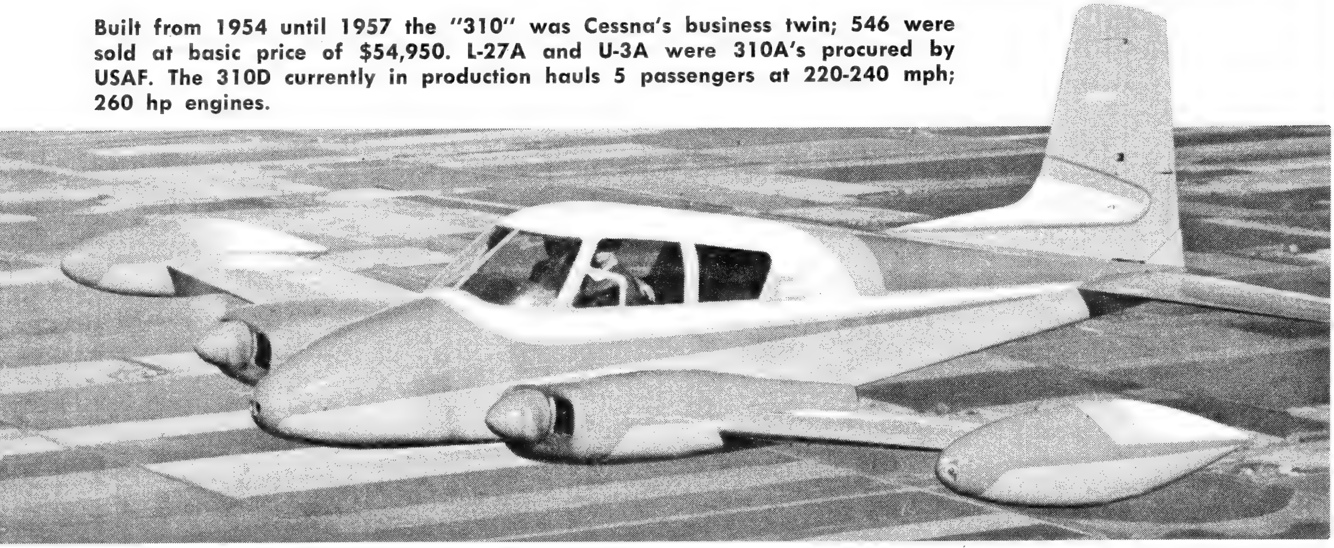


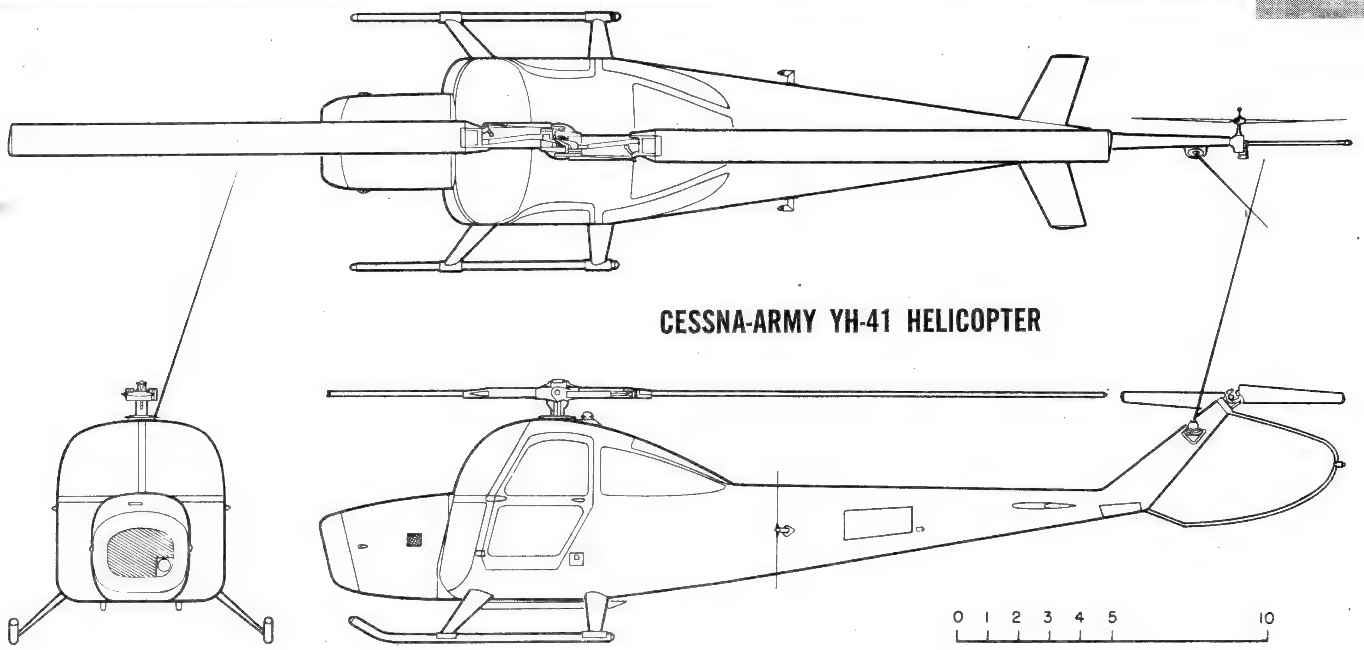


180, 180A, 180B (above) are 4-place jobs with 230 hp engines. Top speed 170 mph, range 845 miles. $14,675 for latest version.

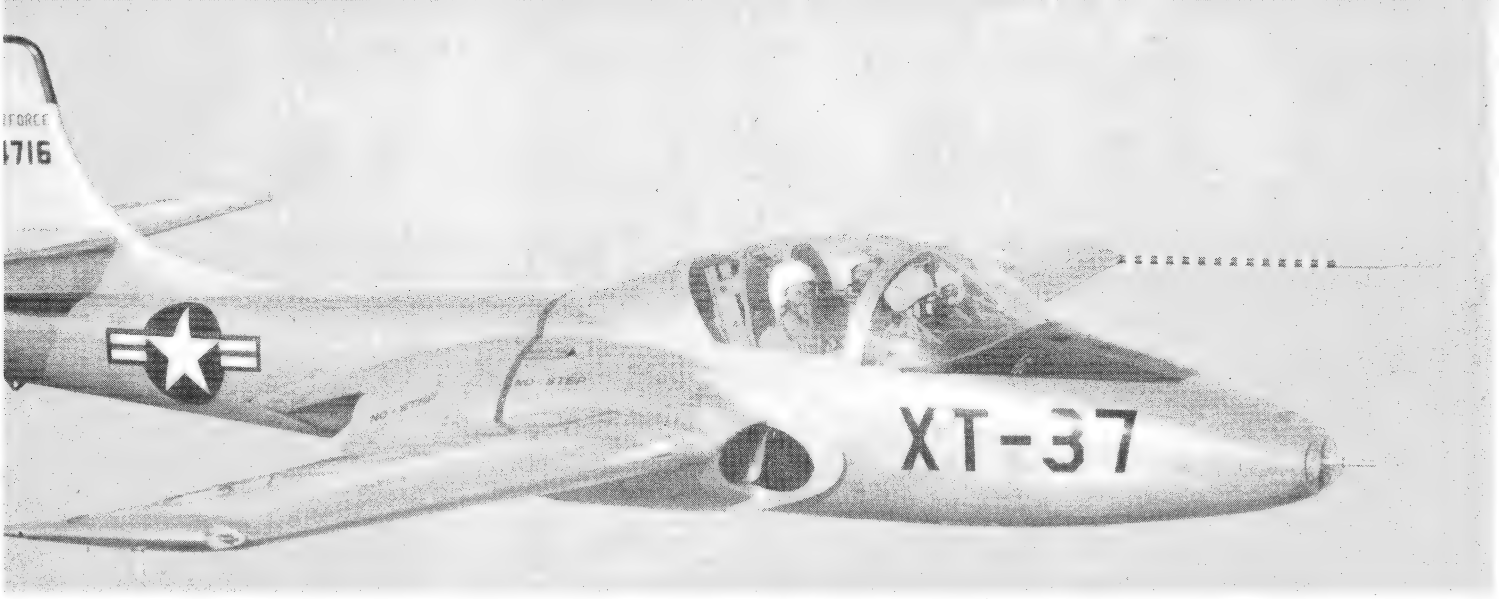
Skylane (right) is deluxe version of 4-place "182", former is 3 mph faster. Spans 36'. 182 sells for $14,890, Skylane for $17,325.

Built from 1954 until 1957 the "310" was Cessna's business twin; 546 were sold at basic price of $54,950. L-27A and U-3A were 310A's procured by USAF. The 310D currently in production hauls 5 passengers at 220-240 mph; 260 hp engines.



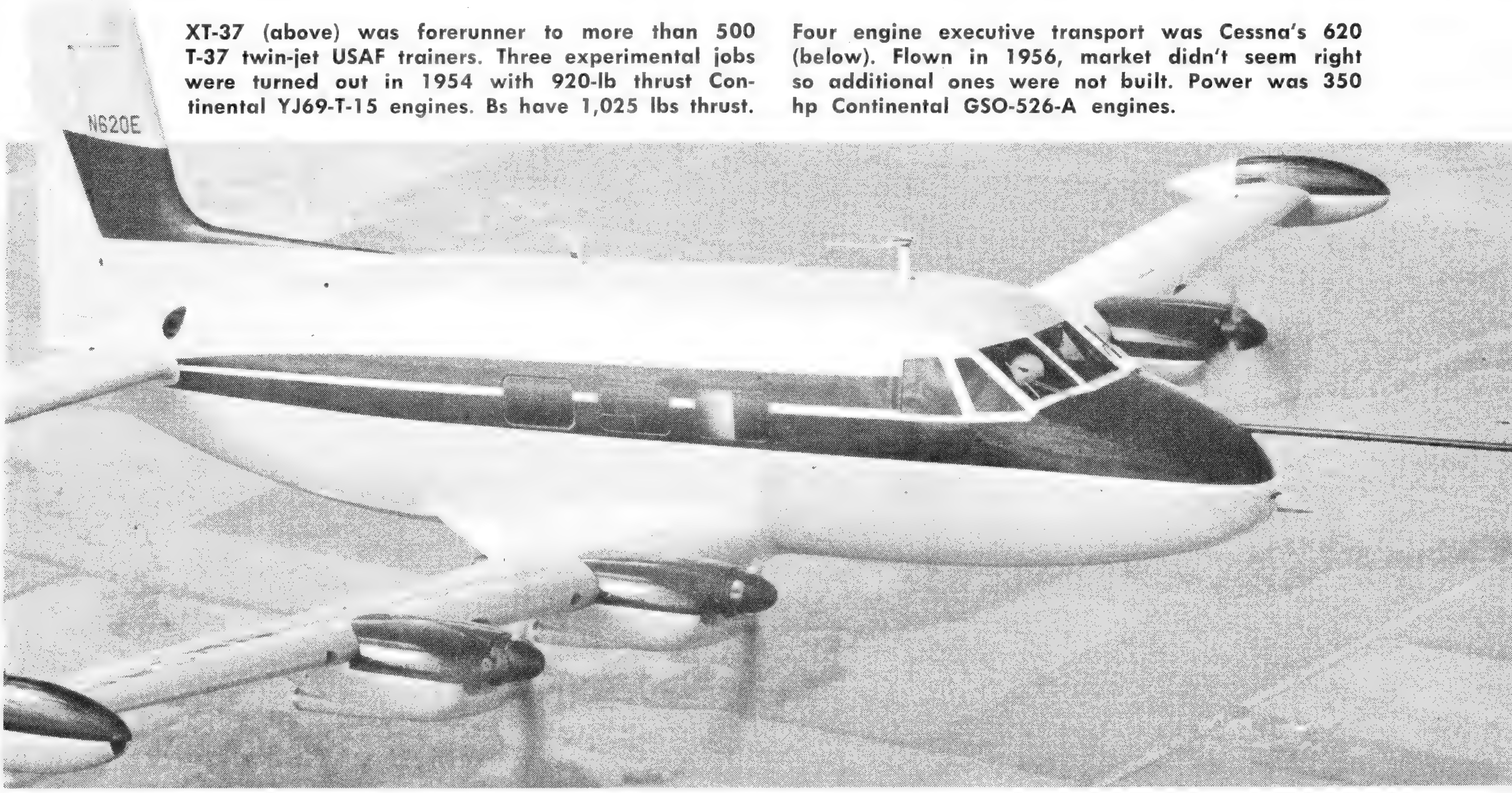


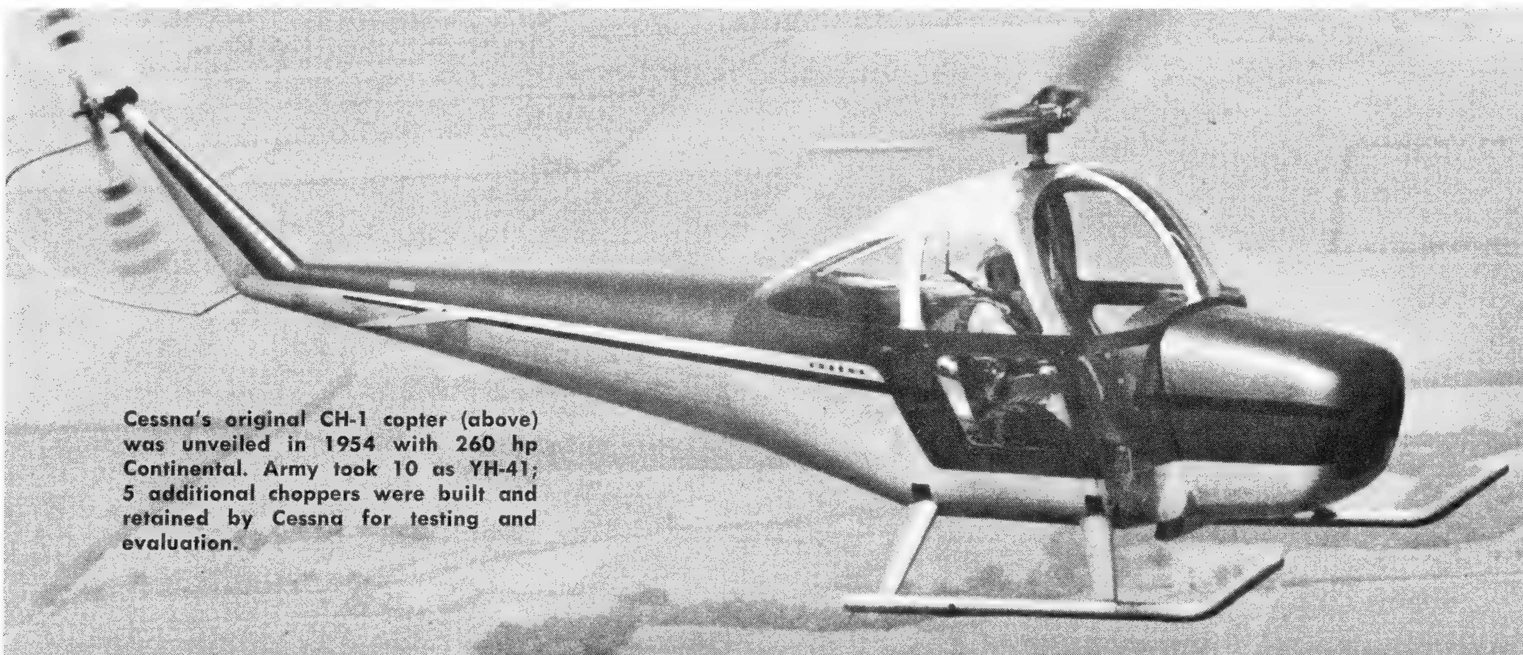
CESSNA-ARMY YH-41 HELICOPTER



XT-37 (above) was forerunner to more than 500 T-37 twin-jet USAF trainers. Three experimental jobs were turned out in 1954 with 920-lb thrust Continental YJ69-T-15 engines. Bs have 1,025 lbs thrust.

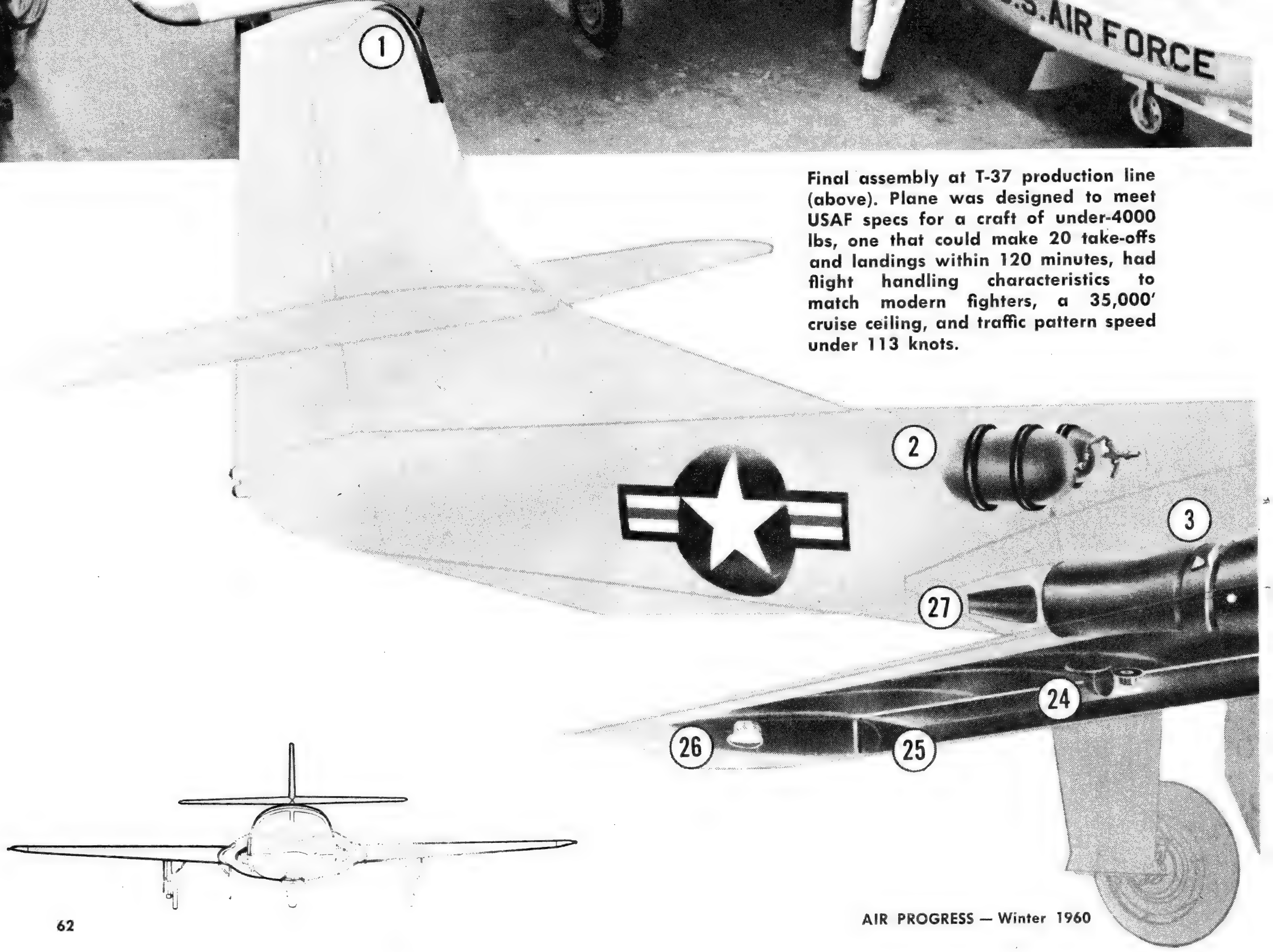
Four engine executive transport was Cessna's 620 (below). Flown in 1956, market didn't seem right so additional ones were not built. Power was 350 hp Continental GSO-526-A engines.

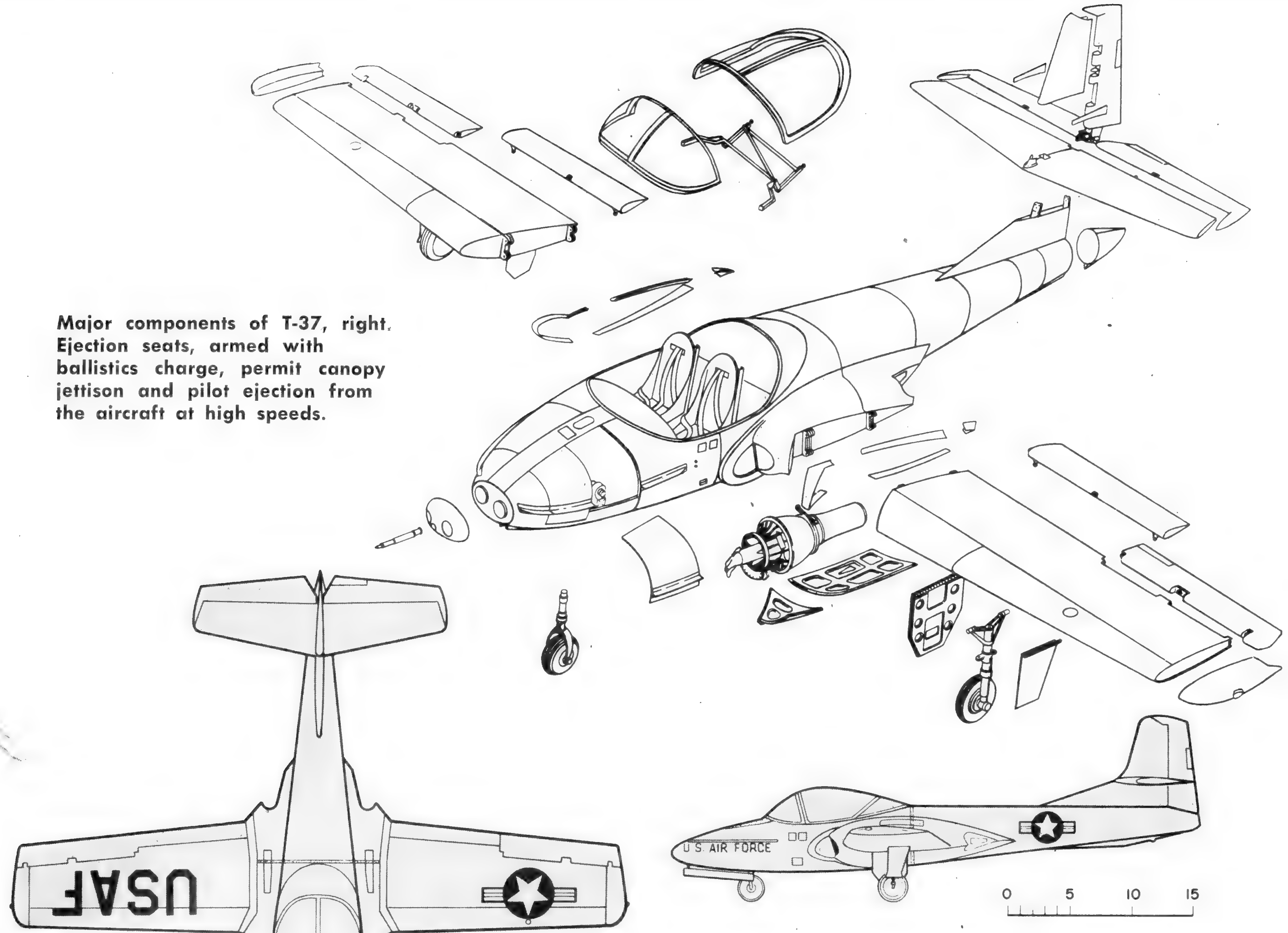




Cessna's original CH-1 copter (above) was unveiled in 1954 with 260 hp Continental. Army took 10 as YH-41; 5 additional choppers were built and retained by Cessna for testing and evaluation.

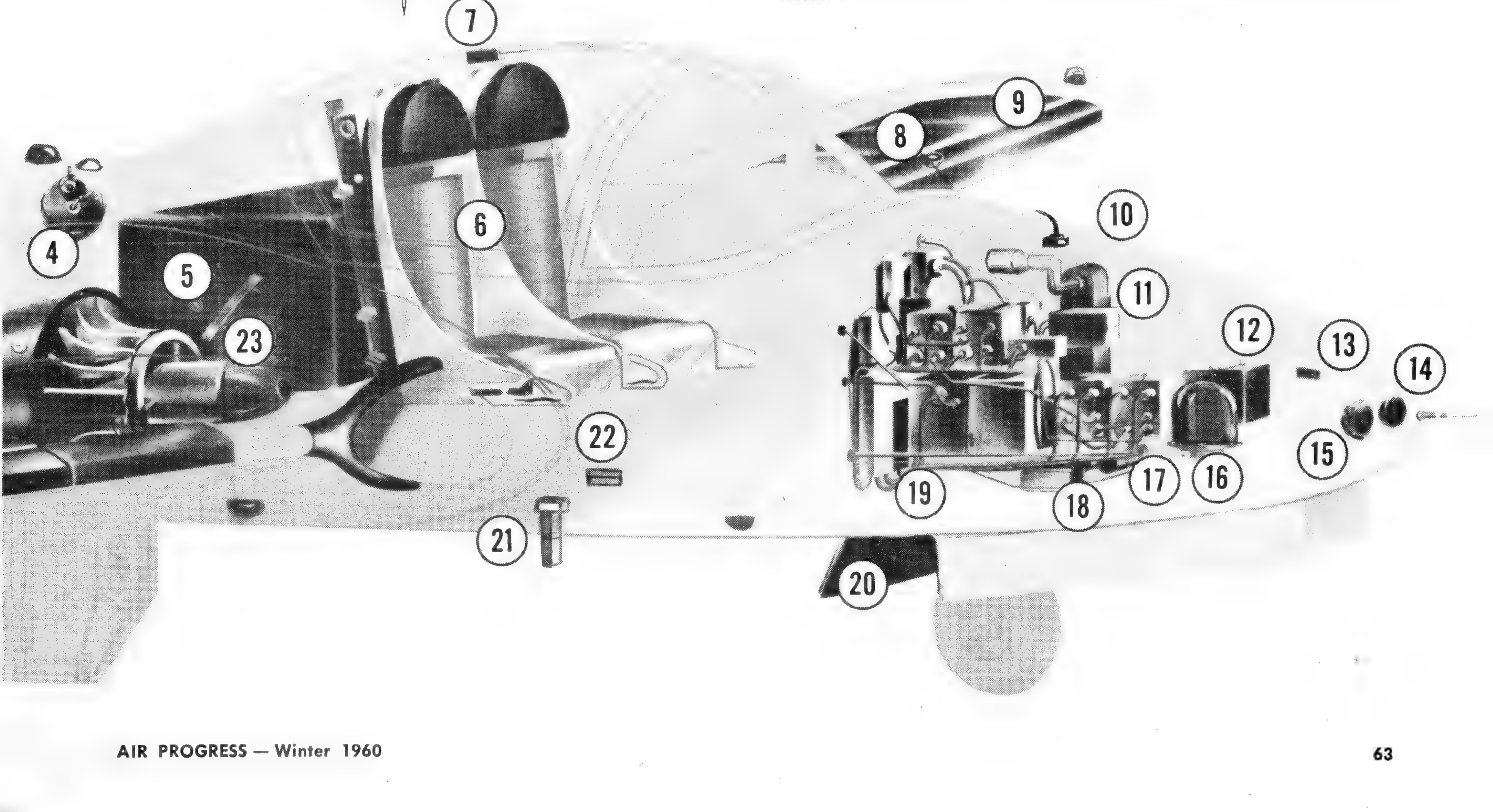
Final assembly at T-37 production line (above). Plane was designed to meet USAF specs for a craft of under-4000 lbs, one that could make 20 take-offs and landings within 120 minutes, had flight handling characteristics to match modern fighters, a 35,000' cruise ceiling, and traffic pattern speed under 113 knots.

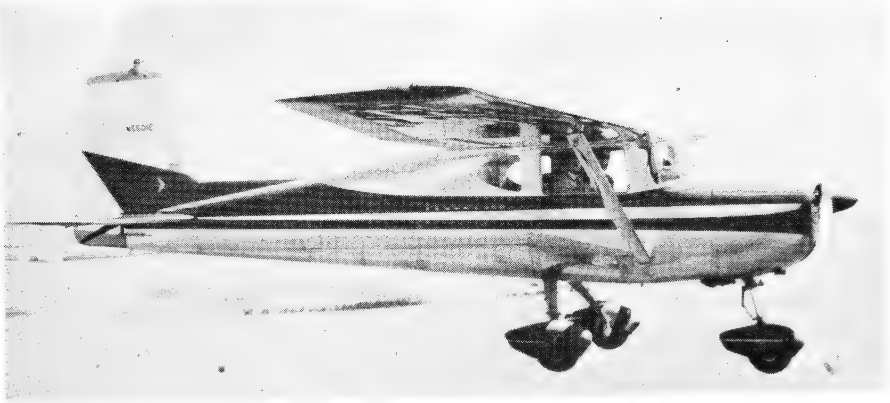




Major components of T-37, right. Ejection seats, armed with ballistics charge, permit canopy jettison and pilot ejection from the aircraft at high speeds.

Cutaway key: 1) VHF communication antenna; 2) oxygen; 3) J69-T-25; 4) hydraulic reservoir; 5) fuel tank; 6) ejection seats; 7) VHF navigation antenna; 8) fuel tank filler cap; 9) fuel tank; 10) UHF communication antenna; 11) air conditioning; 12) battery; 13) external power receptacle; 14) passing light; 15) taxi light; 16) J-2 compass control unit; 17) radio; 18) inverters; 19) marker beacon rcvr antenna; 20) speed brake; 21) UHF communication antenna; 22) step well; 23) spoiler; 24) landing light; 25) fuel tank; 26) navigation light; 27) thrust attenuator.



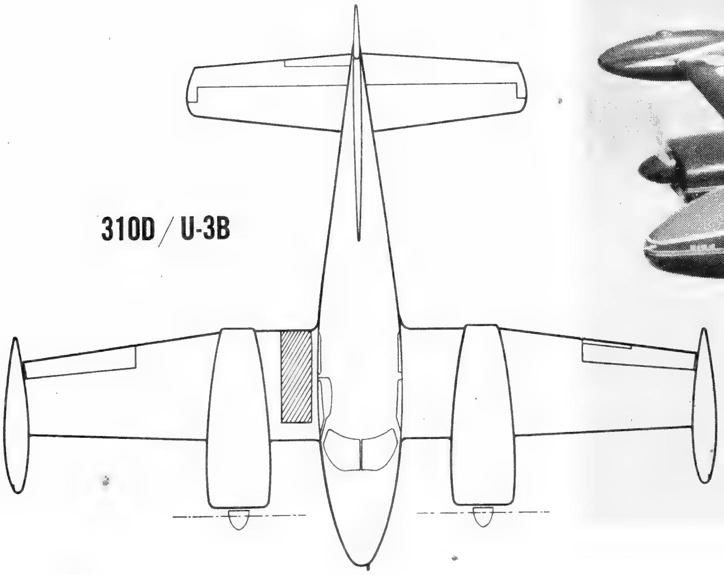


Cessna "150" (left) is lowest-price plane in current line. Four cylinder Continental O-200-A rated at 100 hp. Two place job has maximum speed of 124 mph at sea level. Span 33', 4". Prices at Wichita: $7250 for Standard version, $8150 for Trainer, $8795 for Commuter.

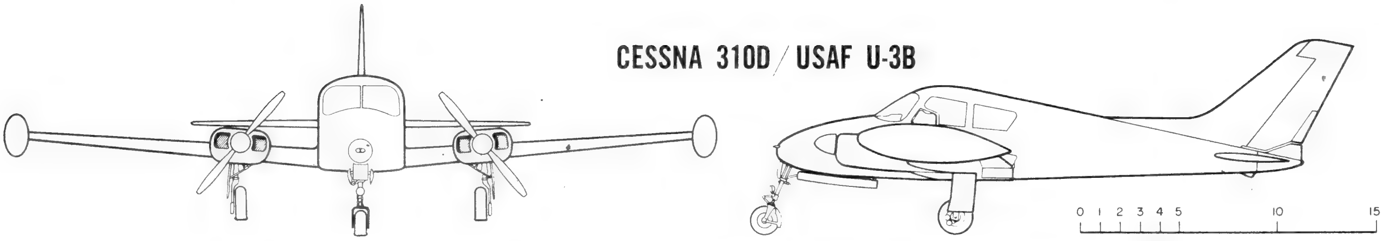
"180C" (right) is also available as float or ski plane. Four passenger, fixed gear 2-wheeler sells for $14,675. Power is 230 hp 6 cylinder Continental 0-470-L. Spans 36 feet; length 26 feet.

"172" at left is 4 passenger, 145 hp job that can cruise at 131 miles per hour for 790 miles. Span 36 feet; length 26' 4". Like all Cessna aircraft today it is all-metal. Price, $9450.

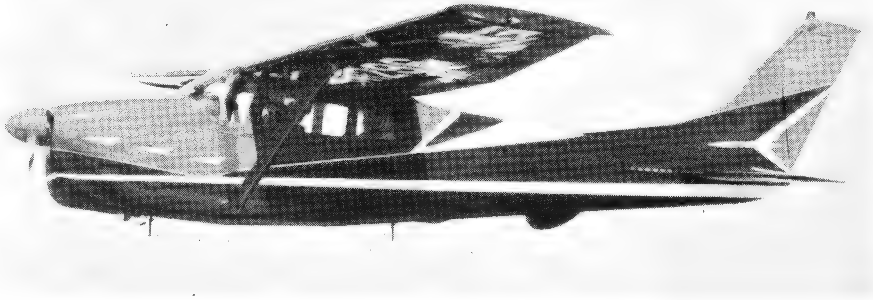
Cessna's latest version of its business twin is 310D (below) which has been purchased in quantity by USAF as U-3A and U-3B. Power is two Continental 6 cylinder 10-470-D 240 hp engines. Can climb on one engine 440'/min. Spans 36'.



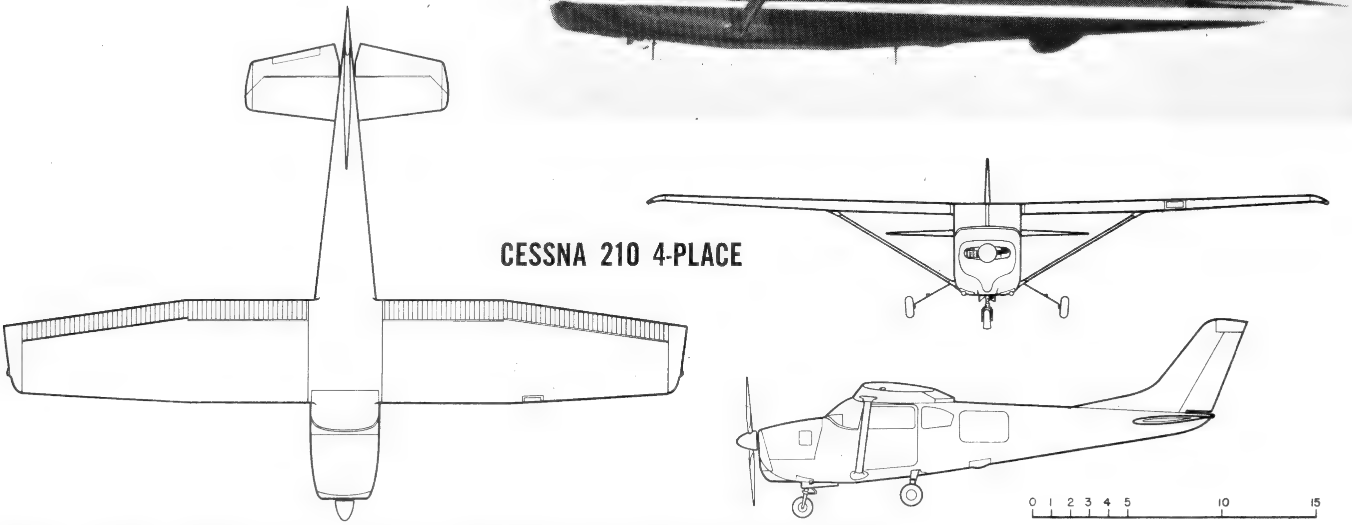
CESSNA 310D / USAF U-3B

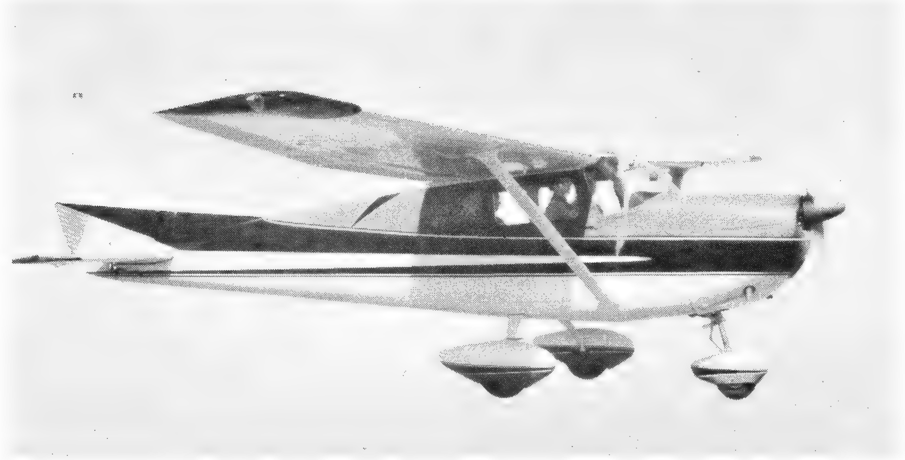


Retracting-gear "210" (right) cruises at 190 mph, has 1100 mile range. Uses 6 cylinder Continental 10-470-E of 260 hp. Spans 36′ 6″; length 27′ 4″. Price at Wichita, $22,450.



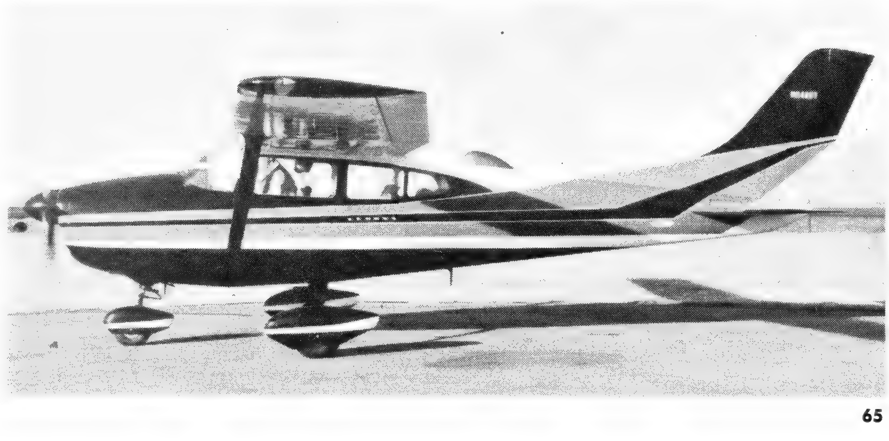
CESSNA 210 4-PLACE

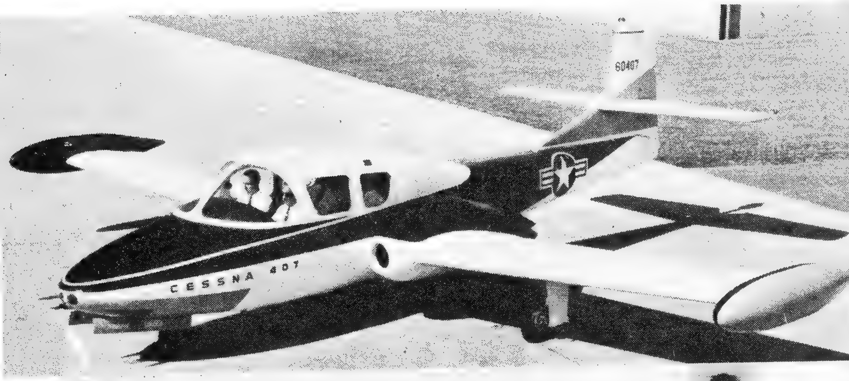




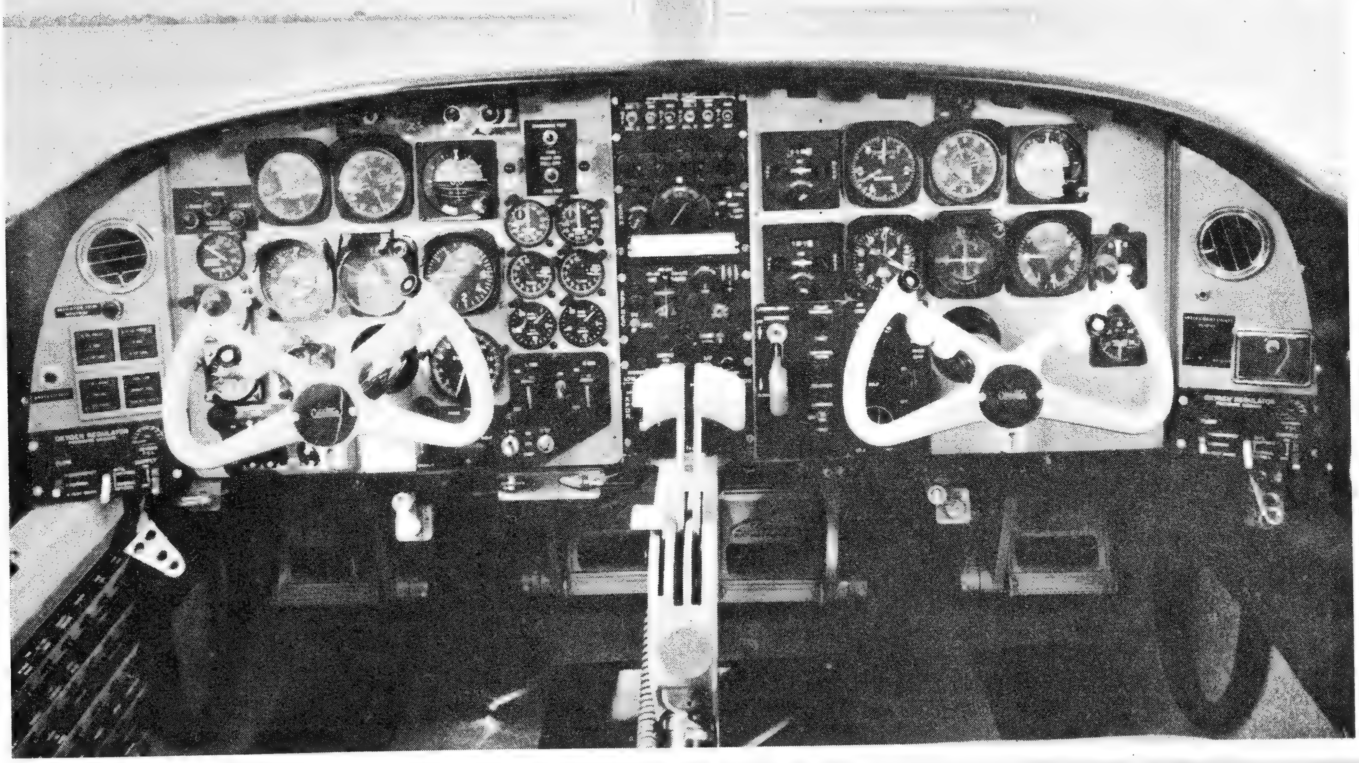
Deluxe version of the Cessna 175A is Skylark (left). You can also get this 4-placer with floats. Uses 175 hp 6 cylinder Continental GO-300-C. Spans 36′; length 26′ 4″. 175 is $11,600; deluxe Skylark, $13,050. Latter cruises at 142 mph, has 760 mile range.

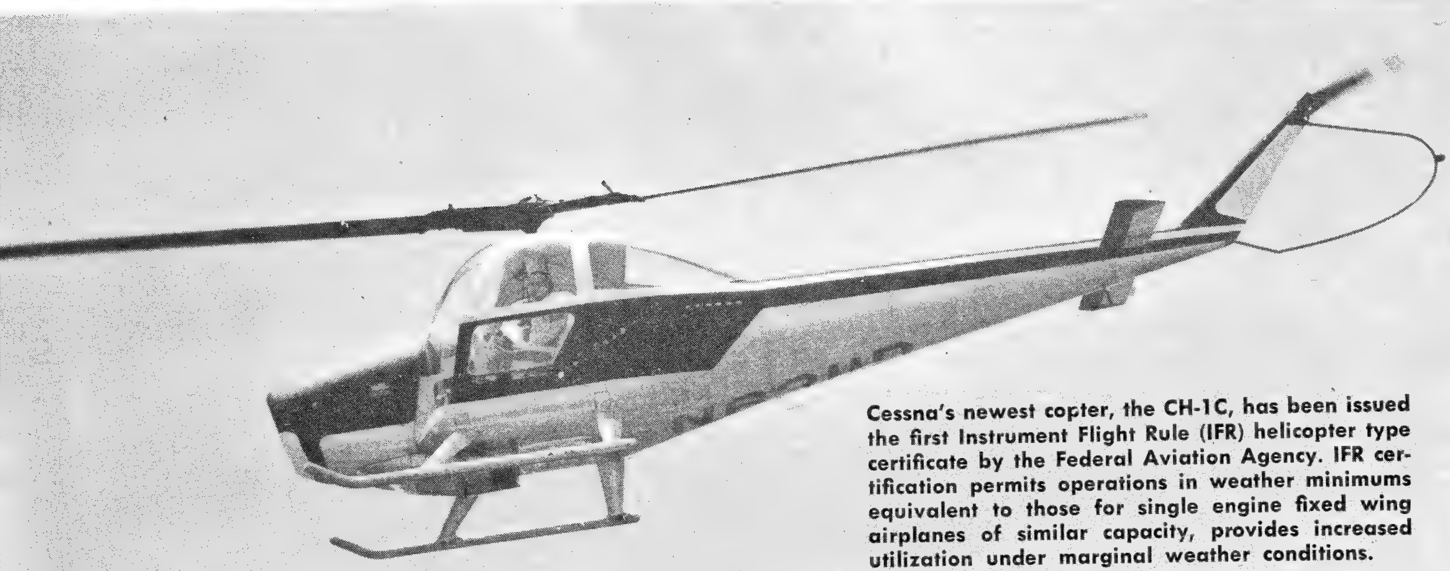
Skylane (right) is deluxe version of current Cessna 182. This 4-place job cruises at 157 mph for 835 miles. Spans 36′; length 27′, 1″. 182 sells for $14,890; Skylane for $17,325. Speed fairing on latter is optional "extra" on 182.





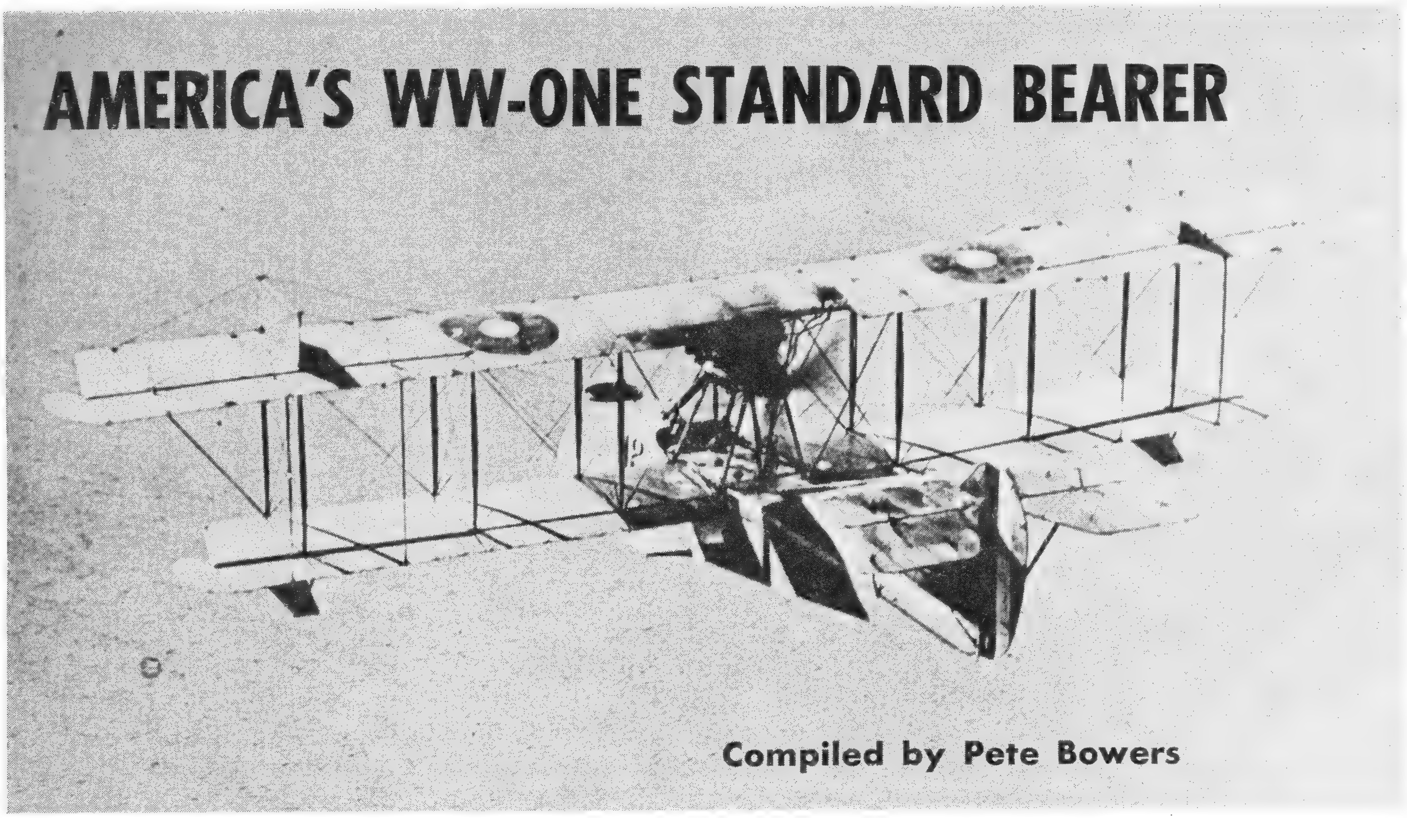
Mockup of "407" 4-place twin-jet craft shows clean lines, uncluttered interior. Instrument panel and controls, below.





Cessna's newest copter, the CH-1C, has been issued the first Instrument Flight Rule (IFR) helicopter type certificate by the Federal Aviation Agency. IFR certification permits operations in weather minimums equivalent to those for single engine fixed wing airplanes of similar capacity, provides increased utilization under marginal weather conditions.

AMERICA'S WW-ONE STANDARD BEARER



Compiled by Pete Bowers

■ The Curtiss HS-1 flying boat was the only American-built airplane to serve with U. S. Naval forces in Europe during World War I. While many Curtiss twin-engine boats were used by the British Royal Naval Air Service, these had been bought from Curtiss before U. S. entry into the war. Most of the U. S. Navy aircraft used overseas were procured from the French and British.

The Curtiss HS-1 of 1916 was a direct development of the world's first flying boat, a pusher designed and flown by Glenn Curtiss in 1912. This basic configuration was widely copied by the major aircraft building powers and all the single-engine flying boats of WW-I were pushers. While the pusher engine arrangement was gradually replaced by the tractor type in the years between the wars, pusher biplane boats, notably the Supermarine Walrus, were still in service in WW-II (see *Air Progress,* Fall 1959).

The HS-1 prototype was a two-seater powered with a 200 HP Curtiss V-X-X engine driving a three-blade propeller. The wings and tail surfaces were wood, fabric covered, and the hull was laminated from long crisscrossed strips of wood veneer. The basic hull structure was relatively narrow, although accommodating the two crew members in a side-by-side cockpit just forward of the wing. Extra bouyancy and additional bottom area for planing on the water during takeoff and landing were obtained by adding long sponsons to each side of the hull from the nose to the step . . . which was located just behind the center of gravity.

U. S. entry into WW-I brought a demand for single-engine patrol bomber flying boats, and the HS-1 was redesigned to accommodate an extra crew member in a nose cockpit and military load in the form of bombs and defensive armament. The installation of the American-built Liberty engine late in 1917 resulted in the designation of HS-1L for the new model, the L identifying the Liberty. HS-1's were shipped to France, where they first operated from the U. S. naval station at L'Aber Vrach, Finestere.

In spite of the increased power, the increased weight of the HS-1L made takeoff and climb difficult, so the Navy requested additional wing area. This was obtained very simply by inserting additional six-foot panels in each set of wings between the center section and the outer panels. The new model was designated HS-2L, and could be identified easily by the extra bay of wing struts on each side of the hull, the wider flat center section area, and a balanced rudder.

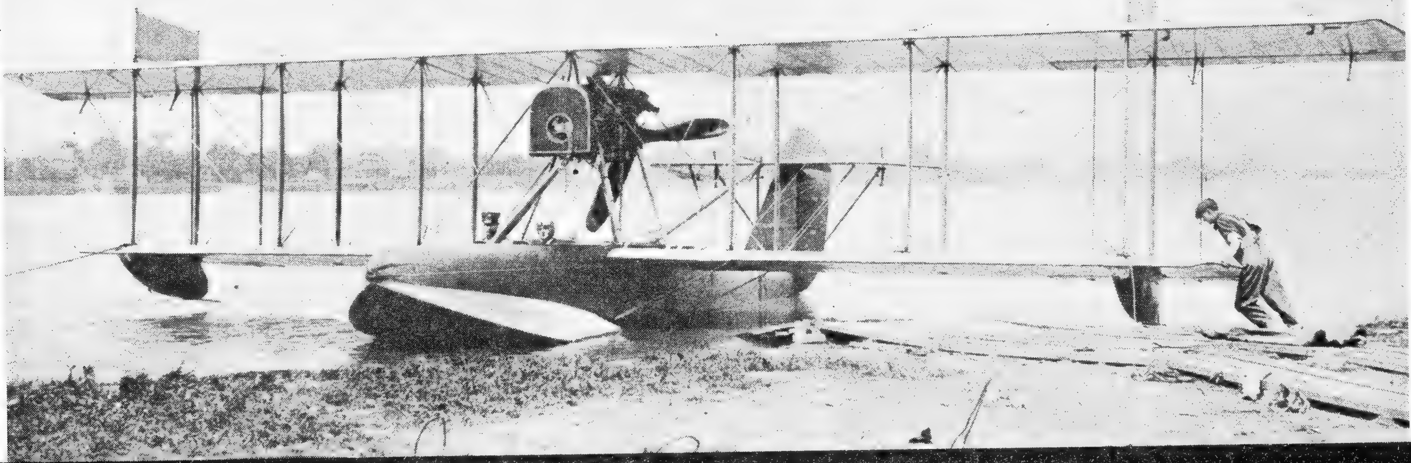
Military demand for the HS-2L was more than Curtiss could meet, so the Navy invited other firms to bid on production orders and contracts were given to Standard; Lowe, Willard, and Fowler (LWF); Loughead (now Lockheed); and Boeing. The Naval Aircraft Factory also built HS-2L's. Curtiss, meanwhile, developed a more advanced model, the HS-3, with revised hull and tail surface configuration, but the end of WW-1 killed the demand and only four were delivered.

While most of the HS-2L's still on order at the time of the Armistice were cancelled, the HS-2L remained in naval service until about 1927. Others that had been sold as surplus were in civilian service in Canada until 1929. In postwar years, the Naval Aircraft Factory fitted some HS-2L wings to new conventional landplane type fuselages on twin floats to produce a new design known as the PT-1 (no relation to the Army PT-1 primary trainer).

Wartime color of the HS boats was all gray, with U. S. white-center circles on the wings just inboard of the ailerons, and red, white, and blue rudder stripes with the blue at the trailing edge. After the war, wing and horizontal tail coloring was gradually changed to silver, the circle marking was replaced by the star-in-the-circle marking originally adopted in May, 1917, and the order of the rudder stripes was reversed. The last HS models in service had the upper surfaces of the top wing and horizontal tail painted chrome yellow.

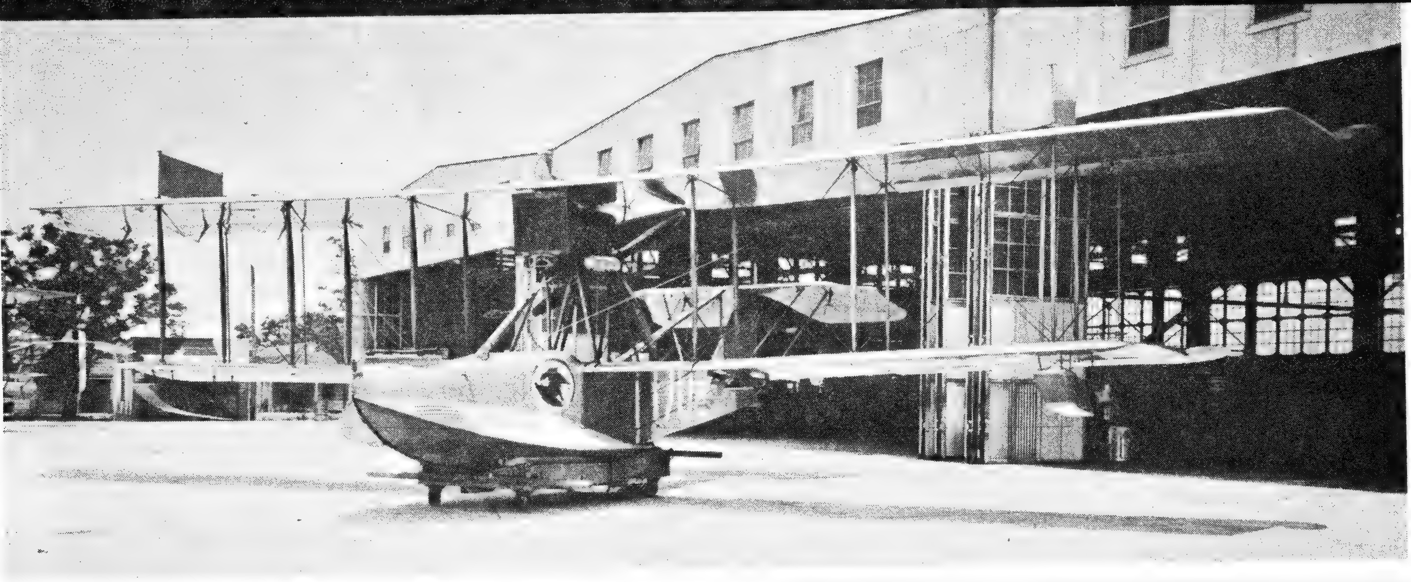
MODEL	HS-1L	HS-2L	HS-3
SPAN	62′1″/52′2″	74′1″/64′2″	75′6″/61′5″
LENGTH	38′6″	39′0″	38′7″
WING AREA	653 sq ft	803 sq ft	824 sq ft
GROSS WEIGHT	5910 lb	6432 lb	6432 lb
TOP SPEED	87 mph	85 mph	89 mph
LANDING SPEED	57 mph	51 mph	53 mph

CURTISS FLYING BOATS

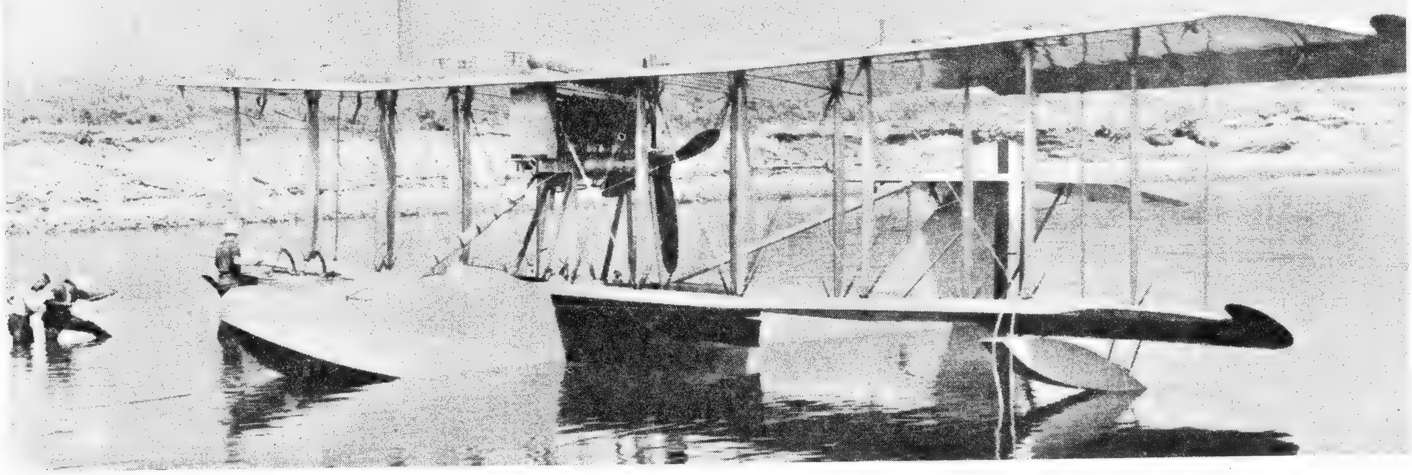


Above, The original Curtiss HS-1 flying boat, a two-seater with 200 HP Curtiss V-8 engine and three-blade propeller. Notice "Skid Plates" on upper wing above outer wing struts and wide sponsons on the sides of forward part of hull.

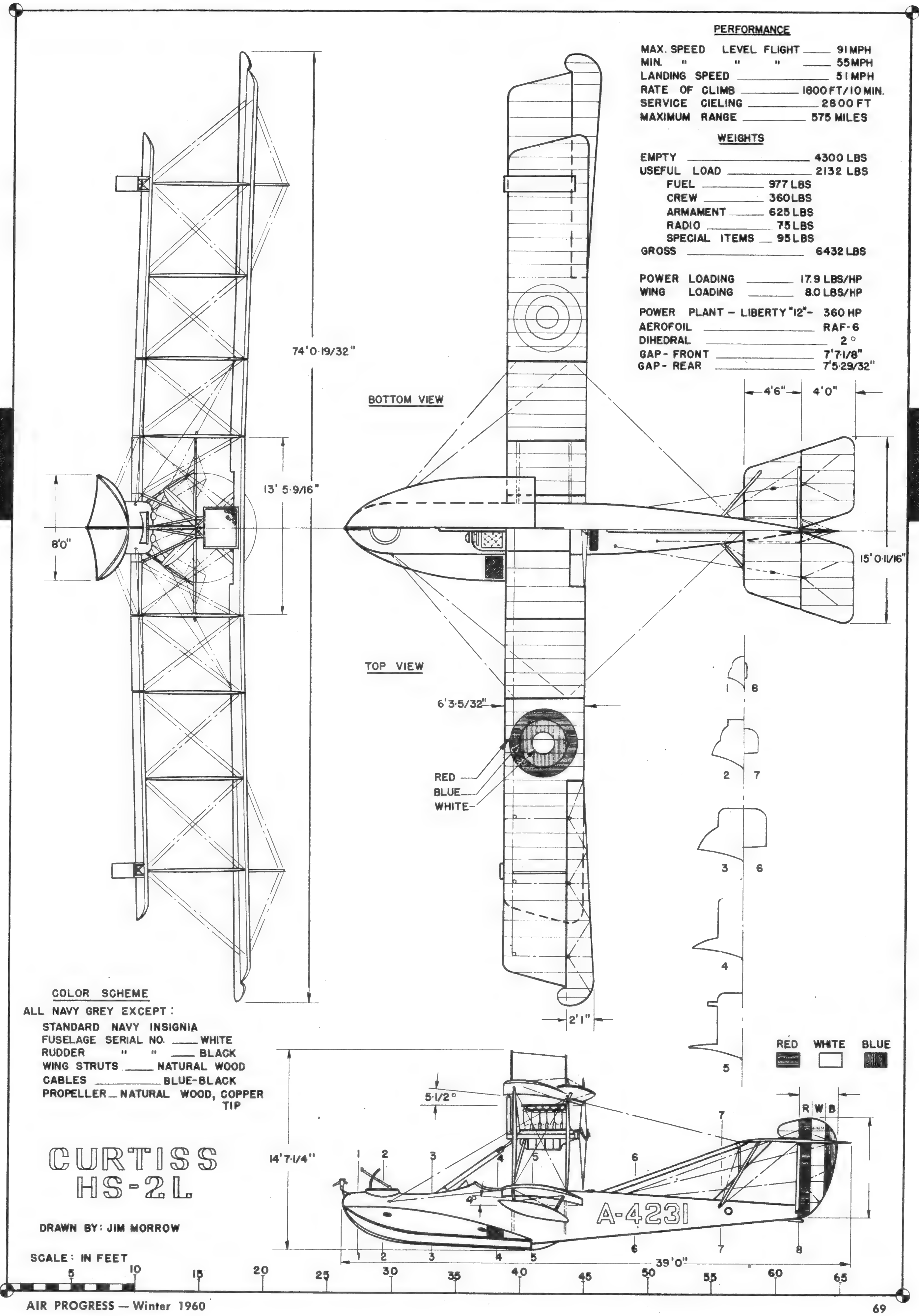
Below, Curtiss HS-1L, generally similar to HS-1 but fitted with 400 HP Liberty engine, additional cockpit in nose, and two degrees of dihedral in outer wing panels. Wartime production models were all gray with white serial numbers.



First HS-2L, showing wingspan increased through addition of flat six-foot panels on each side of center section and additional bay of interplane struts. Rudder on this particular plane retains shape of earlier HS-1L rudder. Compare with other HS-2L photos.



CURTISS HS-2L



PERFORMANCE

MAX. SPEED LEVEL FLIGHT	91 MPH
MIN. " " "	55 MPH
LANDING SPEED	51 MPH
RATE OF CLIMB	1800 FT/10 MIN.
SERVICE CIELING	2800 FT
MAXIMUM RANGE	575 MILES

WEIGHTS

EMPTY		4300 LBS
USEFUL LOAD		2132 LBS
FUEL	977 LBS	
CREW	360 LBS	
ARMAMENT	625 LBS	
RADIO	75 LBS	
SPECIAL ITEMS	95 LBS	
GROSS		6432 LBS

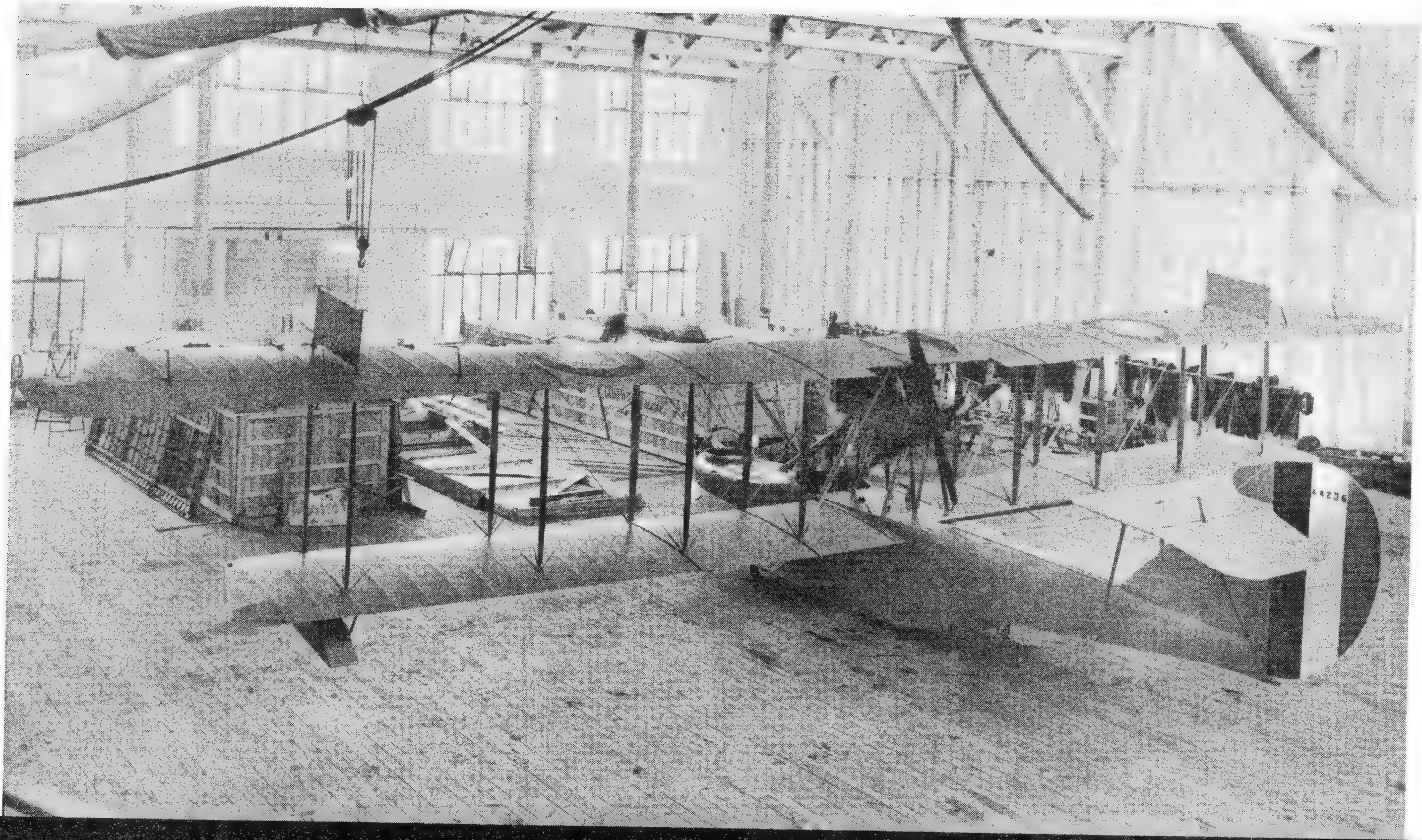
POWER LOADING	17.9 LBS/HP
WING LOADING	8.0 LBS/HP
POWER PLANT - LIBERTY "12" -	360 HP
AEROFOIL	RAF-6
DIHEDRAL	2°
GAP - FRONT	7'7·1/8"
GAP - REAR	7'5·29/32"

COLOR SCHEME

ALL NAVY GREY EXCEPT:

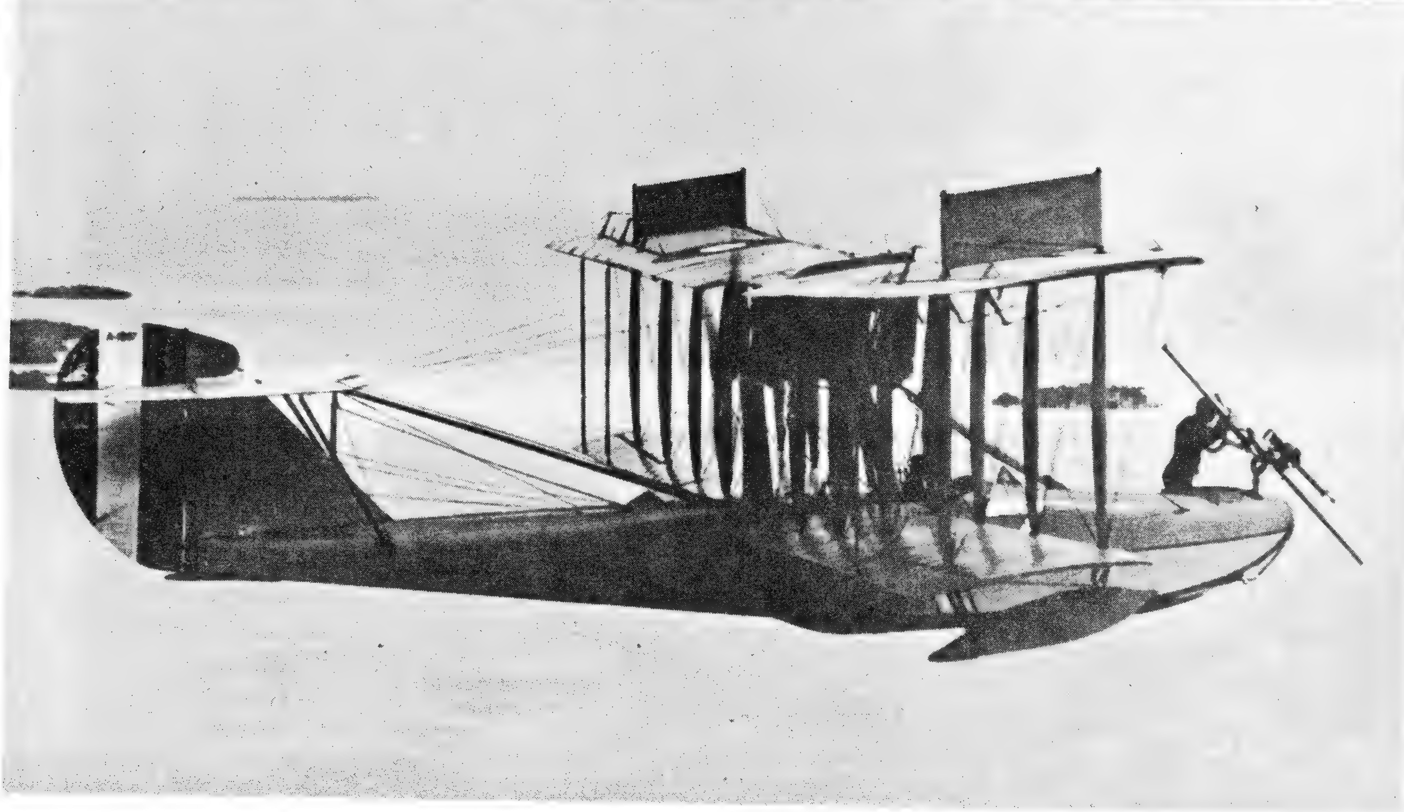
STANDARD NAVY INSIGNIA
FUSELAGE SERIAL NO. — WHITE
RUDDER " " — BLACK
WING STRUTS — NATURAL WOOD
CABLES — BLUE-BLACK
PROPELLER — NATURAL WOOD, COPPER TIP

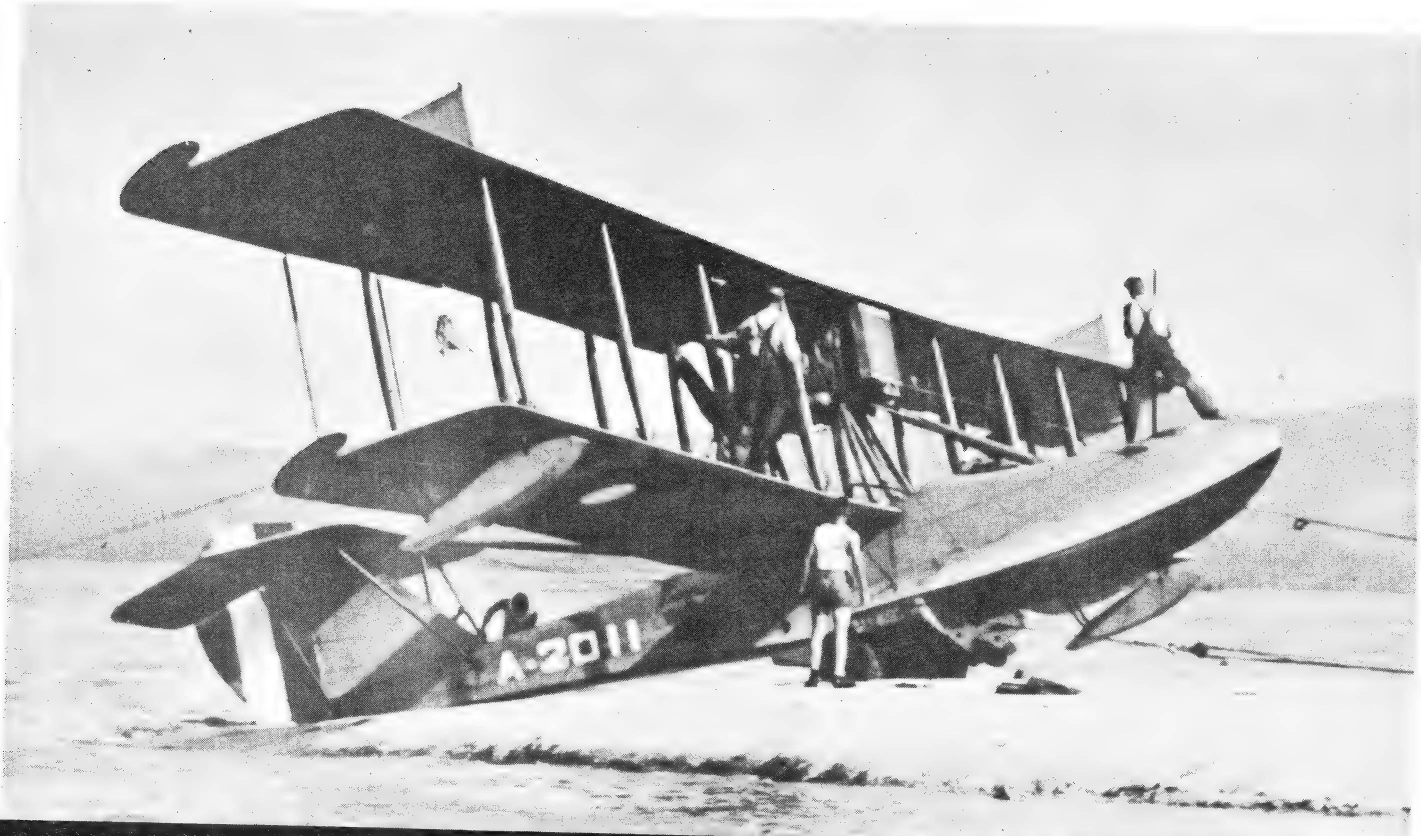
DRAWN BY: JIM MORROW



Above, One of 25 Boeing-built HS-2L's. Half of initial order for 50 was cancelled after the Armistice. Extra six-foot panels inserted to increase HS-2L span 12 feet over HS-1L are evident in 3/4R view photo. Boeing HS-2L differed from others in not having ailerons on lower wing.

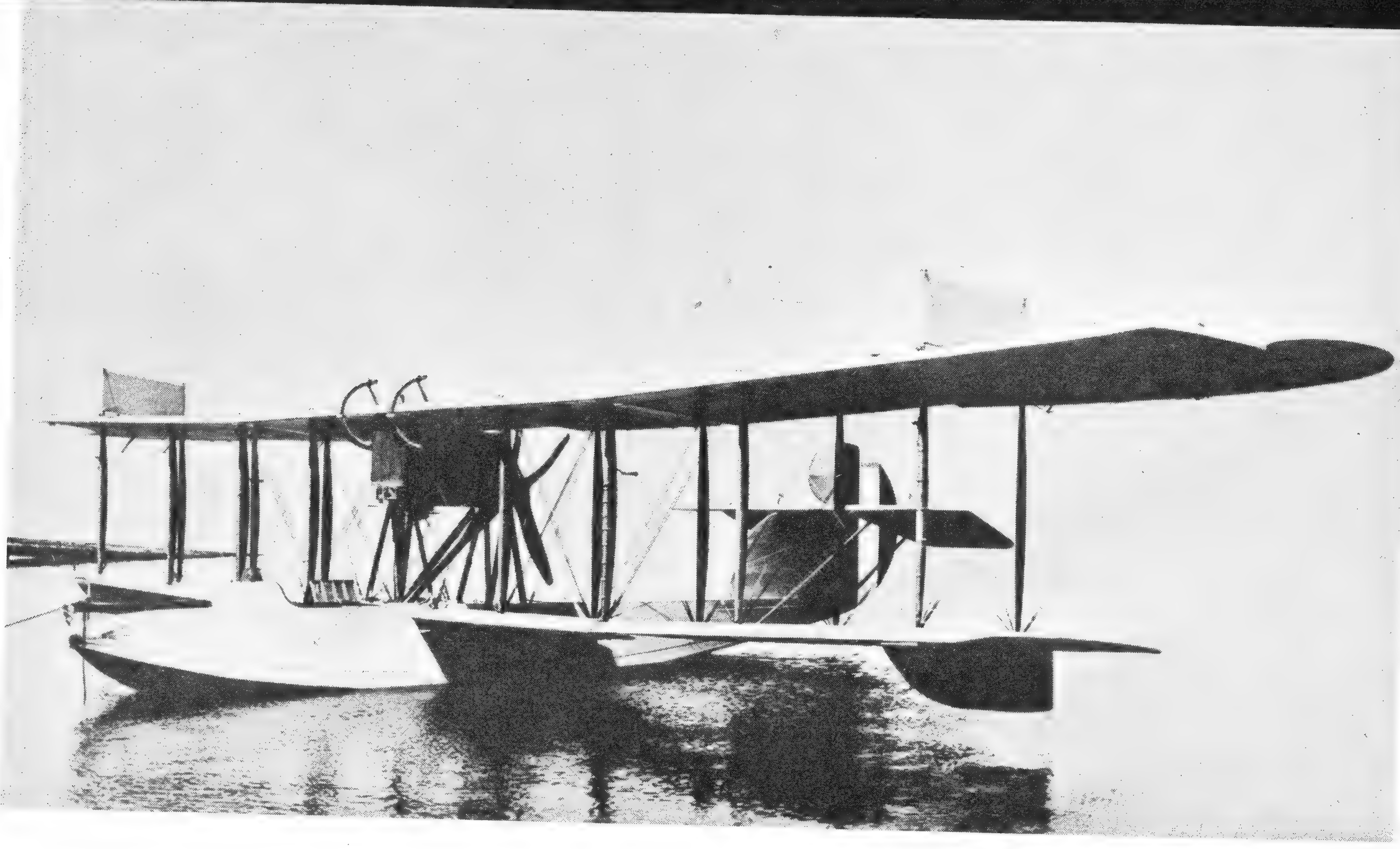
Below, Unique armament used on some HS-2L's was "Davis non-recoil Cannon," which fired a compensating charge to rear to cancel out recoil. Gunner had to be careful not to blast his own plane. Conventional Lewis machine gun is shown on same mount as Davis cannon.





Above, Large size of single-engine HS-2L is evident by comparison with crew hauling U.S. Marine Corps patrol boat ashore with block and tackle and beaching dolly. If left in water too long, wood hulls waterlogged, handicapping performance with increased weight.

Below, HS-3 last of the HS line. Wing span increased slightly over HS-2L and hull lines considerably refined. Notice completely redesigned vertical tail surfaces. End of World War I and adequate supply of existing HS-2L's ended development and further production of HS-3.

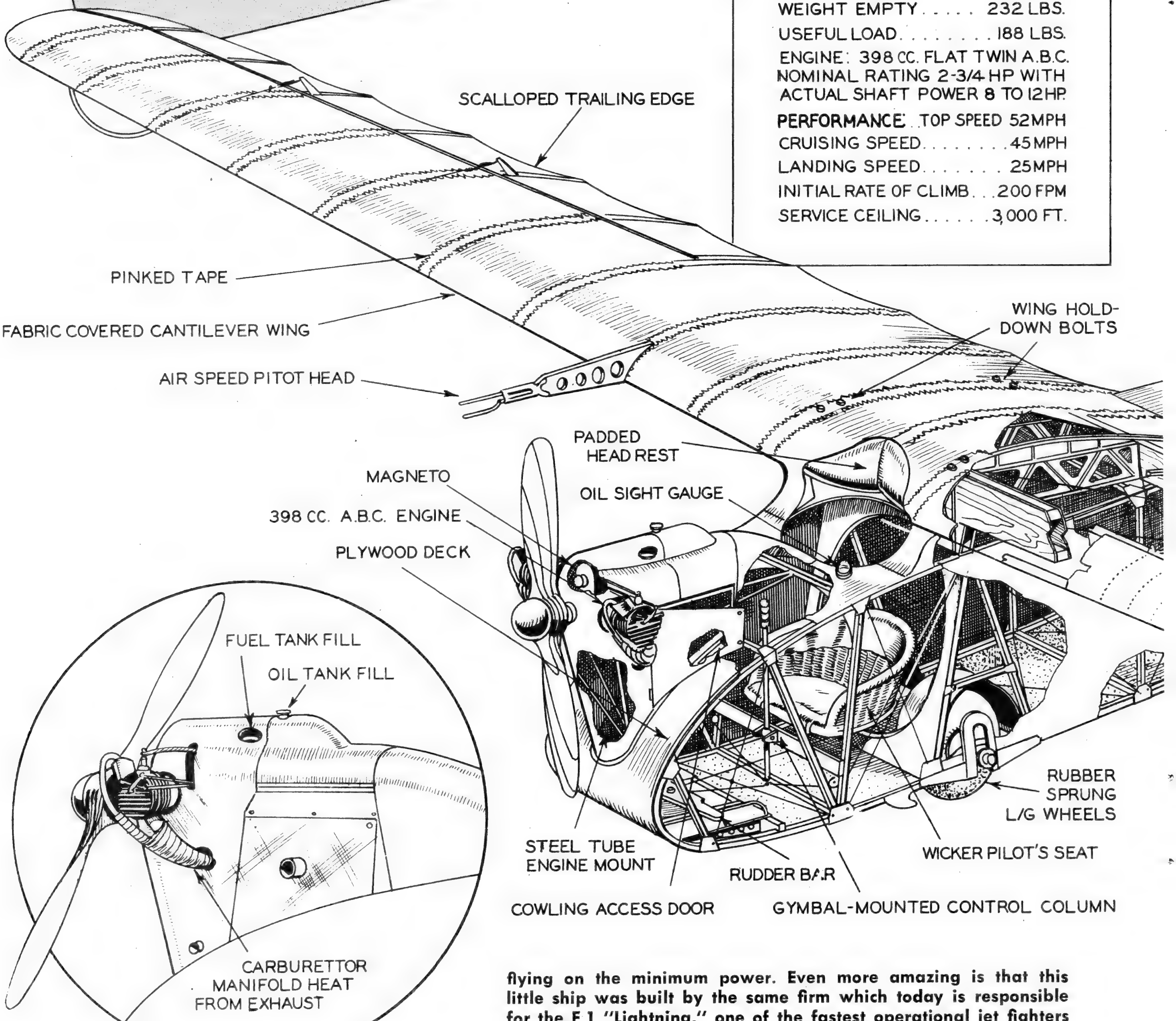


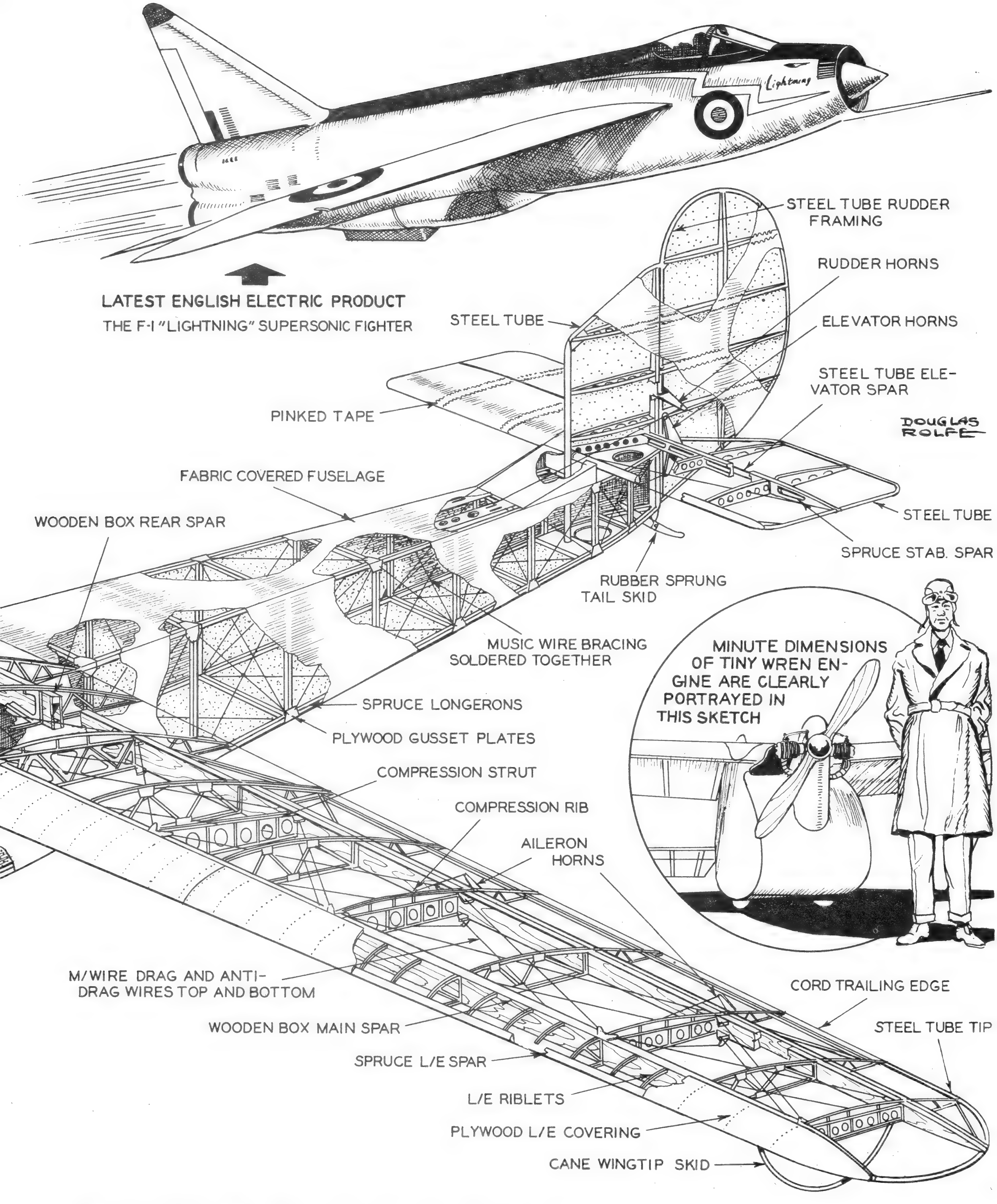
ENGLISH ELECTRIC
WREN

■ One of the most interesting ultra-light airplanes ever built and certainly the lowest powered the little "Wren" first flew at the Light Airplane Trials, Lympne, England, in 1922. Some idea of the extreme smallness of the engine can be gained by looking at the inset drawing with an average sized man standing beside the plane. The engine, an A.B.C. motorcycle engine nominally rated at 2.75 hp, was modified to deliver between 8 and 12 hp but it is a matter of record that it rarely delivered this power and that on several occasions the Wren flew well with one cylinder missing so badly that it was in fact flying on the minimum power. Even more amazing is that this little ship was built by the same firm which today is responsible for the F.1 "Lightning," one of the fastest operational jet fighters flying. And also the "Canberra," one of the world's fastest medium jet bombers. Structural features of the Wren are depicted in this cutaway drawing which shows how low weight was obtained with large wing area and extremely clean lines. A number of noted pilots flew the Wren; all expressed satisfaction at its performance in view of the diminutive horsepower available.

SPECIFICATIONS

WING SPAN	37 FT. 0 IN.
LENGTH OVERALL	23 FT. 0 IN.
HEIGHT OVERALL	4 FT. 9 IN.
WEIGHT EMPTY	232 LBS.
USEFUL LOAD	188 LBS.
ENGINE:	398 CC. FLAT TWIN A.B.C. NOMINAL RATING 2-3/4 HP WITH ACTUAL SHAFT POWER 8 TO 12HP.
PERFORMANCE: TOP SPEED	52 MPH
CRUISING SPEED	45 MPH
LANDING SPEED	25 MPH
INITIAL RATE OF CLIMB	200 FPM
SERVICE CEILING	3,000 FT.

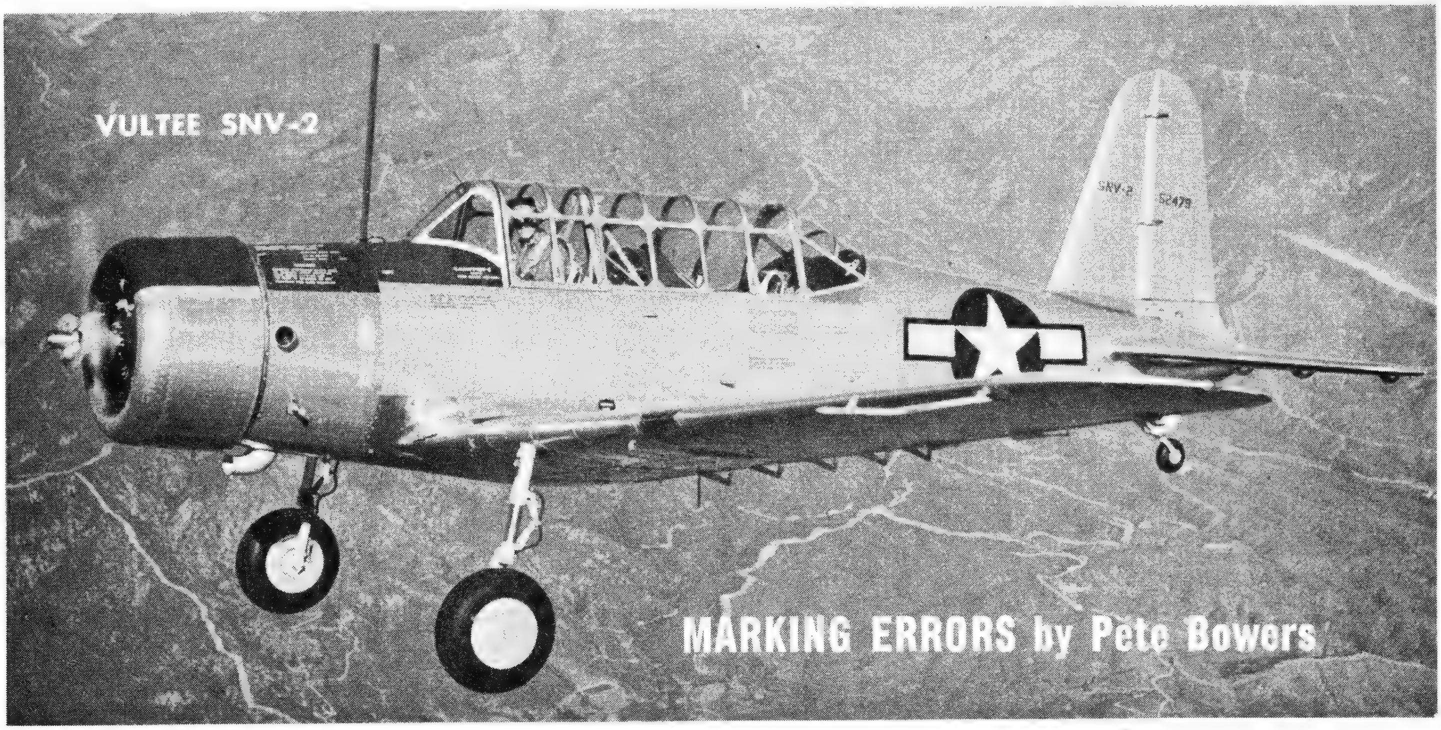




LATEST ENGLISH ELECTRIC PRODUCT
THE F-1 "LIGHTNING" SUPERSONIC FIGHTER

MINUTE DIMENSIONS OF TINY WREN ENGINE ARE CLEARLY PORTRAYED IN THIS SKETCH

Only two models were built, one with rudder as shown, the other with a somewhat smaller rudder. One Wren remains today in serviceable condition and is housed in the Shuttleworth Trust collection of historic aircraft.


VULTEE SNV-2

MARKING ERRORS by Pete Bowers

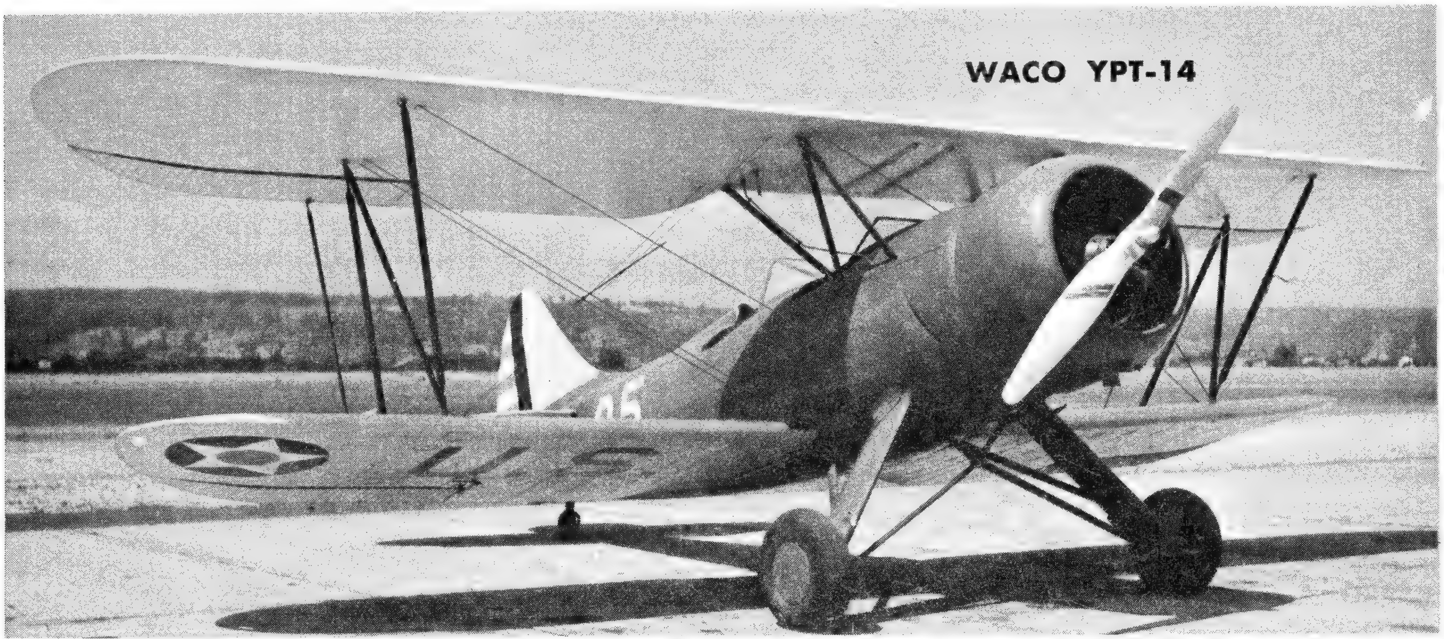
No! Not a Navy "Vibrator"?

■ What, a Navy version of the famous Vultee "Vibrator"? Yes, there were such things, but you had to get pretty close to them after 1941 to tell a Navy SNV from an Army BT-13 or BT-15 since non-camouflaged planes of the two services were not distinguished by different coloring or insignia after that time except for all-yellow primary and instrument trainers in the Navy. The marking error on the SNV-2 illustrated is not in the insignia, and is not too apparent unless you really know your marking details. *How sharp are you?*

The Navy serial number and the Navy model designation on the vertical tail surfaces are transposed. The serial number should be on the vertical fin and the SNV-2 should be on the rudder. While it cannot be seen well enough in the photo to be included in the quiz, there is another error. The name U.S. Navy, with the model designation and serial number, are also painted on the left side of the fuselage in the dark anti-glare area just alongside the pilot's windshield in the standard form used on ARMY planes. Considering the fact that Vultee built only 2,012 SNV's for the Navy compared to 9,525 BT's for the Army, perhaps it can be forgiven for carrying Army practice over to some of the Navy articles.

The Vultee Model 74 was the standard Basic Trainer of both services throughout WW-II. The BT-13/SNV-1 used the 450 HP P&W Wasp engine while the BT-15 used the 420 HP Wright Whirlwind and a revised wing structure. The BT-13A combined the engine of the BT-13 with the airframe of the BT-15. A revised electrical system resulted in the BT-13B, which was also used by the Navy as the SNV-2. Figures are typical of all models.

Wing Span, 42′ 2″; Length, 28′ 8½″; Wing Area, 238


WACO YPT-14

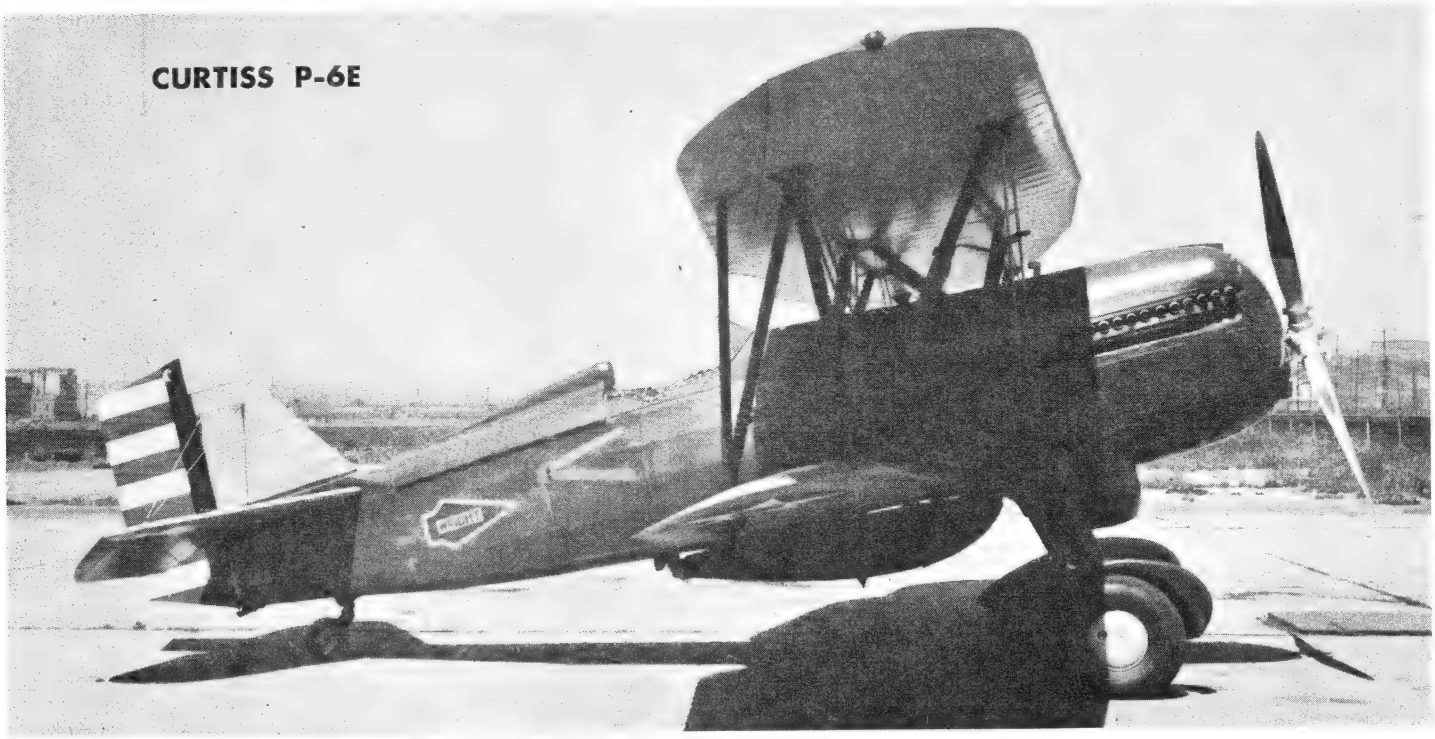
Sq. Ft.; Gross Weight, 4,360 lbs; High Speed, 164 mph; Number Built: 300 BT-13; 6,407 BT-13A; 1,125 BT-13B; 1,693 BT-15; 2,300 SNV-1; 650 SNV-2 (Discrepancy in total by types compared to total built results from some T-13's built for Army transferred to Navy).

While most of the Waco UPF-7's were built for the Civilian Pilot Training Program just before WW-II, a few were tested by the Army to determine their suitability as military primary trainers. Photo-fan readers will note how nicely the white concrete ramp reflects light to reveal underside details and a glaring marking error. What's wrong here?

The proportions of the star are distorted. The arms are supposed to be straight projections across the circle connecting five points spaced equally around the circumference. The red circle, which was deleted in June, 1942, was supposed to be tangent to the projection of the sides of the points across the middle of the marking. See AIR PROGRESS, 1955/56, for details. In this case, the center circle is too large, and the points have been widened to keep the circle from touching the blue background.

The UPF-7 was the last of a long series of open-cockpit Waco biplanes dating to 1924, and was one of the last biplane types produced for the Army. The UPF-7's and the YPT-14's originally appeared with full cowlings as shown, but these were later deleted. Most of the remaining UPF-7's are now in the hands of the antique airplane fans or have been converted to dusters. Figures are for the YPT-14 illustrated.

Powerplant, Continental R-670-3, 220 hp; Span, 30′; Length 23′6″; Wing Area, 244 Sq. Ft.; Gross Weight, 2,650 lbs; High Speed, 132 mph; No. Built: 1 XPT-14; 13 YPT-14; 1 PT-14A.



CURTISS P-6E

The Curtiss P-6E is one of the most popular military airplanes of all time with the collectors and model builders (who are cautioned not to use this photo as a guide to markings). The error should be obvious to anyone familiar with pre-WW-II U.S. Army aircraft.

There's nothing wrong with that arrow marking on the fuselage, which indicates an airplane assigned to Wright Field. The error is in the tail marking, which has only five full red rudder stripes and part of another instead of the full seven with six white between them.

This marking was developed by C. N. Monteith, Chief Engineer at Boeing, to replace the old arrangement of three vertical red, white, and blue tail stripes that the U.S. had copied from Britain and France when it entered WW-I in 1917. The vertical blue stripe was retained at the leading edge of the rudder, but the red and white were applied in a horizontal arrangement of 13 stripes similar to that of the American flag. However, only the Army adopted the new marking, using it from November, 1926 until June, 1942. It had been deleted from camouflaged planes in March, 1941. The Navy adopted a modified version right after Pearl Harbor, using the horizontal stripes only, but deleted it in June, 1942.

The P-6E was the last production model in a long series of Army Curtiss Hawks dating to 1925 (*Air Trails,* August 1948; *Air Progress,* 1953/1954) and was originally ordered under the designation of Y1P-22. Similar airframes with Wright Cyclone radials served Navy as F11C-2 (later BFC-2).

Powerplant, Curtiss V-1570D, 600 hp; Span, 31′6″; Length, 23′ 2″; Wing Area, 261.7 Sq. Ft.; Gross Weight, 3,436 lb; High Speed, 197.8 mph S/L; Armament, 1.30, 1.50 MG, 200 lbs bombs; No. Built, 46.

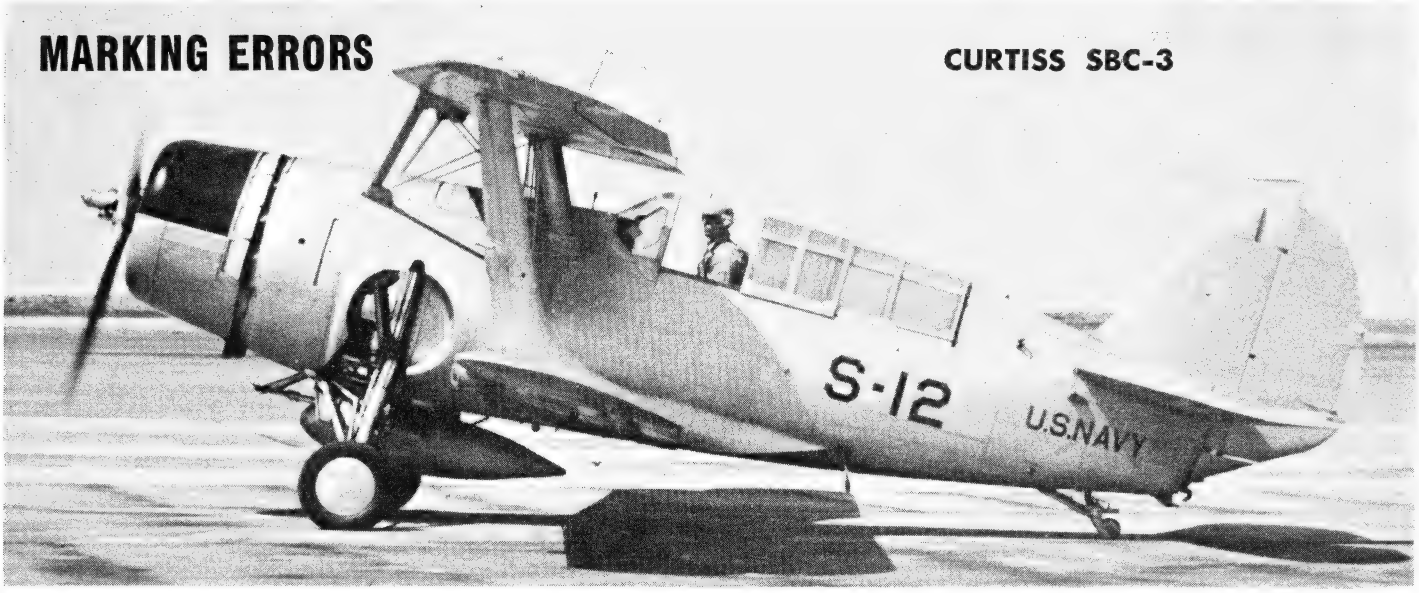
This carrier-based Curtiss SBC-3 displays three, really four, marking errors. Can you spot them on pg. 76?

Most obvious is the absence of the Navy Serial number from the vertical fin and the model designation from the rudder. For prewar Navy planes, these figures should be in black numbers 4″ high. The fuselage designation is incomplete in that the squadron number, which should appear before the "S-for-Scout," is missing. Finally, the figure 12 identifies the airplane as the twelfth in the squadron, but this number is not consistent with the marking on the cowling. Under the rigid squadron organization of the time, No. 12 was the third airplane of the fourth three-plane element of the squadron. Beside the number, it was identified by having the BOTTOM half of the cowling painted black, which was the color code used to identify the fourth element. Airplane No. 10, the element leader, had the entire cowl painted while No. 11, the second man in the element, had the upper half of the cowl painted. No. 11's cowling is installed on No. 12 in the illustration.

The Curtiss SBC-3 was an all-metal 2-seat bomber that joined the fleet in 1936. Later SBC-4's with Wright Cyclone engines equipped many reserve squadrons in 1939/40 before going to the French Navy prior to WW-II.

MARKING ERRORS

CURTISS SBC-3

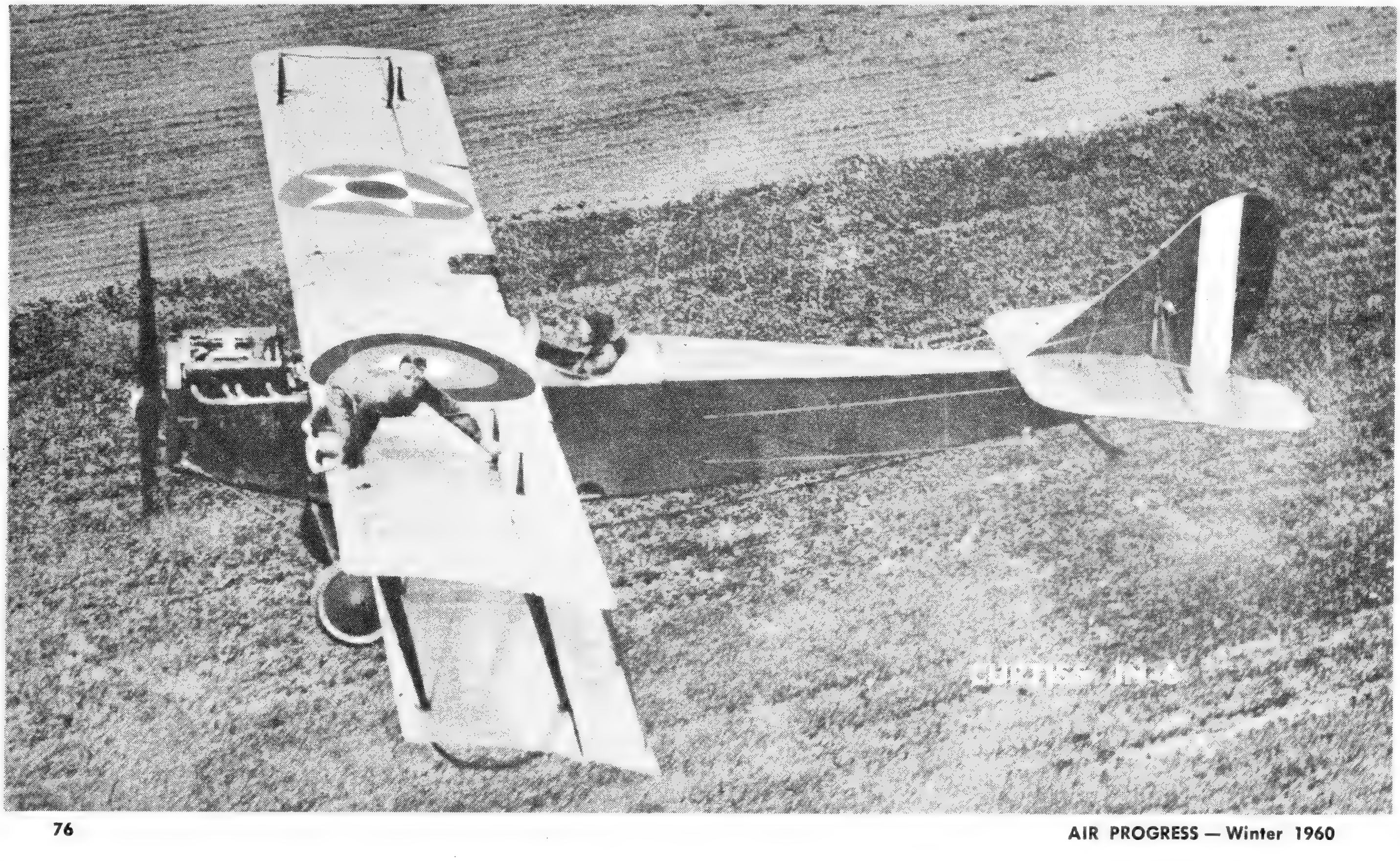


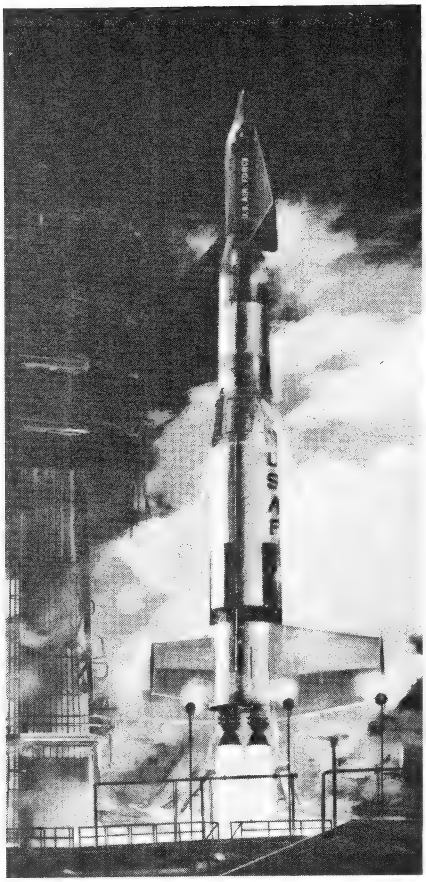
Powerplant, P&W R-1535-94, 750 hp; Span 34′; Length, 28′ 1½″; Wing Area, 317 Sq. Ft.; Gross Weight, 6,023 (Scout), 6,904 (Bomber); High Speed, 220.8 mph (S), 217.8 mph (B); No. Built, 82.

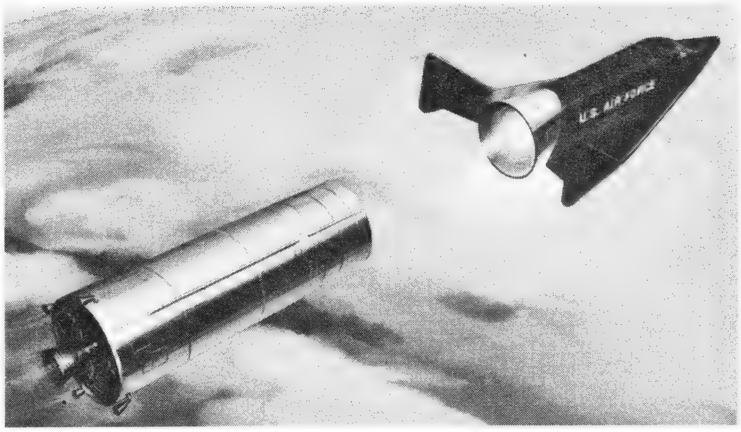
Since it was rather hard to see in the photograph (because of the wing walker and the reflected light) the major marking discrepancy on this Army Curtiss JN-6H, the use of the Star-in-Circle insignia on the right wing and the WW-II white-center circle on the left, has been retouched for clarity. Your opportunity for some interesting Sherlock Holmes-type deduction lies in determining which of the markings is wrong for this particular airplane. Another error may provide a clue.

The circle marking is out of date compared to the star. Although the star had been adopted in May, 1917, it was replaced by the circle in January 1918 at the request of our WW-I allies, and the rudder stripes were reversed from their original order of red at the trailing edge to blue. Both the wing and tail markings reverted to the old arrangement in August, 1919. A few trainers that did not get repainted carried the 1917 markings almost to the end of the war, which could further confuse the situation presented here.

Since red photographed darker than blue on the orthochromatic film of the time, the photo shows that the red stripe is at the trailing edge. This could be 1917 striping only if the airplane happened to be fitted with a rudder from an older JN-4D, since there were no JN-4H's or JN-6's in 1917. It is safe to assume, therefore, that the picture was taken after August, 1919, and that the left wing is a replacement that had been stored with the 1918 circle on it. The post-1919 date is further confirmed by the fact that the star has been applied with a point toward the trailing edge instead of toward the leading edge, a rather common error in early postwar markings. It was also fairly

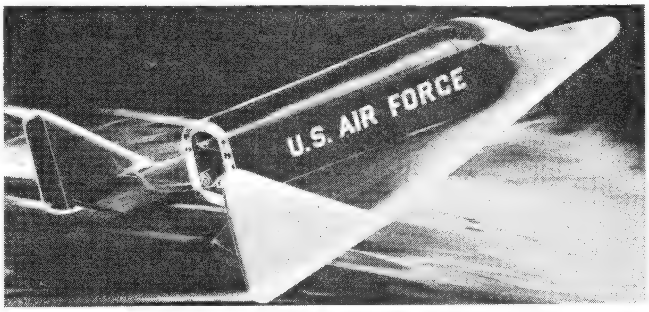

CURTISS JN-4





Boeing artist's impression of Dyna Soar manned space glider as it is launched by modified Titan ICBM missile, in near orbital flight, and glowing from heat created by friction as it re-enters earth's atmosphere. Boeing is prime contractor to USAF for system and glider, Martin for the booster.

DYNA SOAR



common for the early barnstormers who used war-surplus planes for wing-walking and other exhibition work to leave the original markings on them.

The JN-6, an improved version of the JN-4H, could be distinguished from it mainly in having ailerons on the lower wing. The JN-4H was an advanced trainer identical to the earlier JN-4D primary trainer except for the installation of a 150 hp Wright-Hispano "A" engine in place of the 90 hp Curtiss OX-5. Regardless of engine or actual model designation, all were universally referred to as "Jennies." The Army scrapped its last Jenny in August, 1927.

Powerplant, Wright-Hispano "A", 150 hp; Span, 43′ 7⅜″; Wing Area, 352.6 Sq. Ft.; Gross Weight, 2,687 lbs.; High Speed, 79.2 mph; No. Build, 1035; Length 26′ 11⅜″.

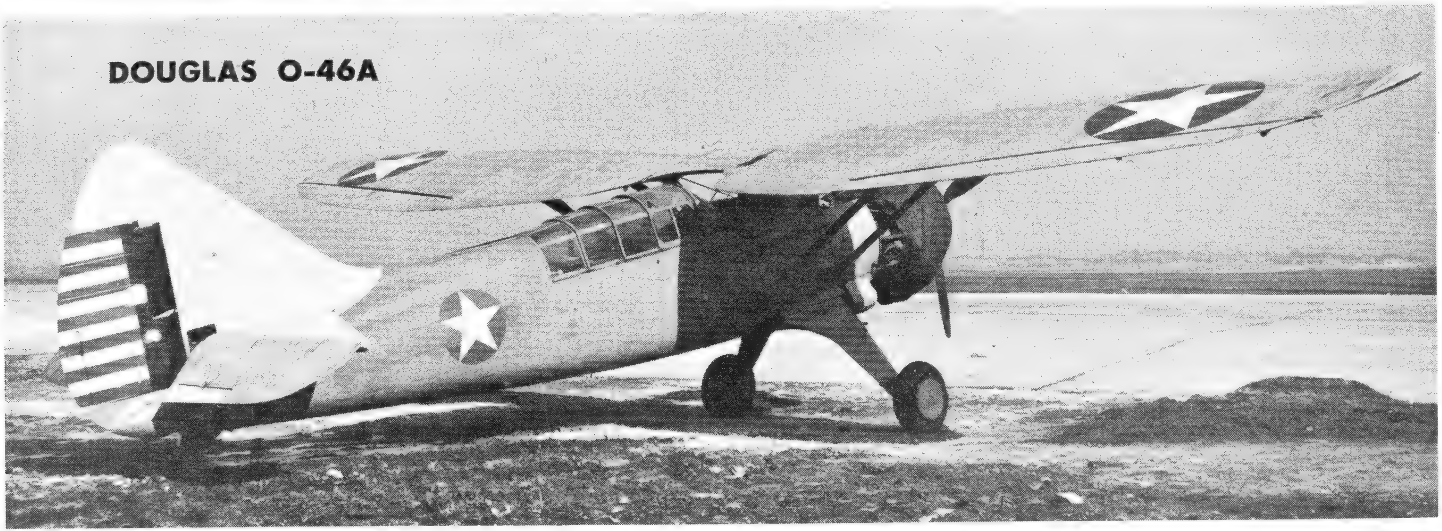
Three separate marking errors appear on this Douglas O-46A. Can you spot them all?

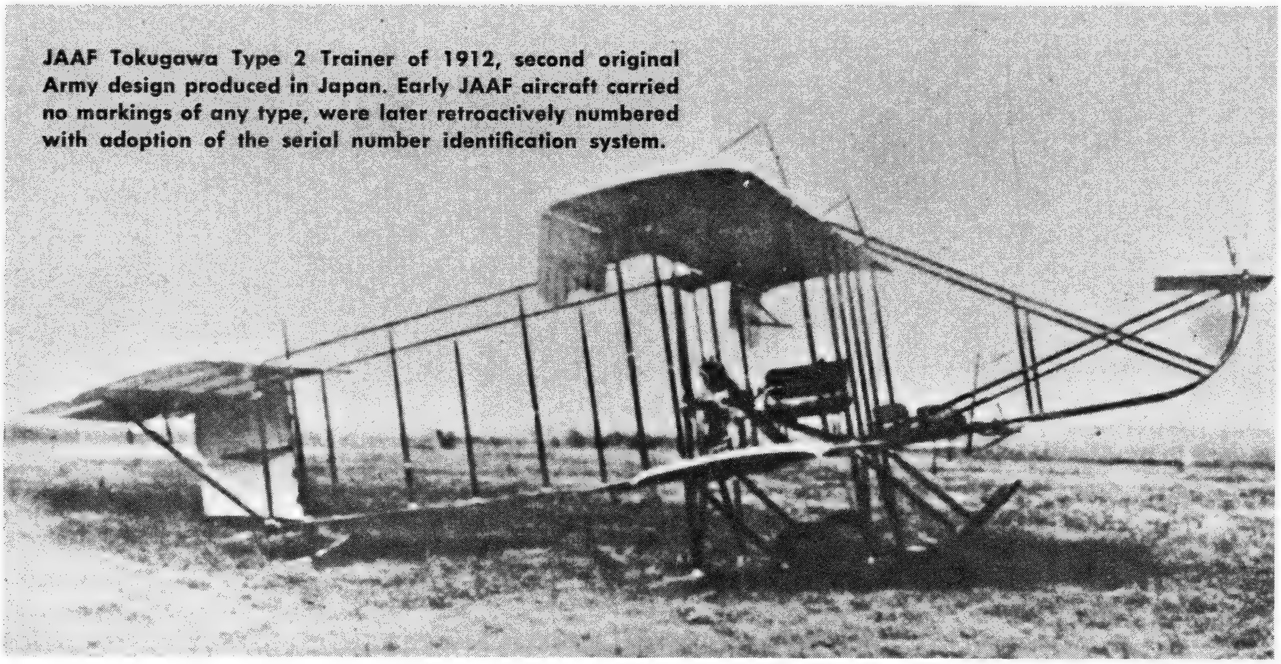
First, the absence of the red centers from the old Star-in-Circle insignia indicates that the picture was taken after June, 1942, when the red was deleted from U.S. military aircraft markings. At the same time, the old Army tail stripes illustrated, adopted in November 1926 and deleted from camouflaged planes in March 1941, was to be removed from the non-camouflaged types. Shortly after this change, the star was added to the side of the fuselage on non-camouflage types, and on Army models, the upper right and lower left wing star were deleted. Navy, however, continued to use stars on both wings for another year. Finally, the Army Air Corps serial number for the airplane should have been painted in block figures on the vertical fin, a practice that is still standard for all U.S. Army and Air Force planes.

The O-46A was the final model in a long series of Douglas observation monoplanes used from 1930 until WW-II.

Powerplant, P&W R-1535-7, 725 hp; Span, 45′ 9″; Length, 34′ 9″; Wing Area, 334 Sq. Ft.; Gross Weight, 6,135 lbs; High Speed, 200 mph; Armament, 1 fixed, 1 flex .30 MG; No. Built, 90.

DOUGLAS O-46A





JAAF Tokugawa Type 2 Trainer of 1912, second original Army design produced in Japan. Early JAAF aircraft carried no markings of any type, were later retroactively numbered with adoption of the serial number identification system.

Japanese Aircraft Markings

Compiled by RICHARD M. BUESCHEL

■ Japan is unique among major world powers in that the aircraft insignia adopted late in 1918 remains in use today, with no self-imposed change in over forty years of service. The very nature of the Japanese insignia made any change virtually impossible, for while other nations employed various insignia superficially based on national colors and heraldry, changing the markings as various political or military conditions demanded it, the Japanese utilized their age-old *Hinomaru,* or "Rising Sun", national emblem. This marking was steeped in religious and cultural tradition, and any change would have been regarded as an ill omen.

Use of the *Hinomaru* was as practical as it was emotional. Consisting solely of a solid red circle, its colorful simplicity assured easy identification over long distances. Minor variations of application through the years, such as outlining with a white circle, or applying the *Hinomaru* over a white or yellow field, served to increase the visibility. Although the latter variations were widely used during the Pacific War, the basic *Hinomaru*—or "Meatball" as it was known to Allied airmen—remained the sole official insignia.

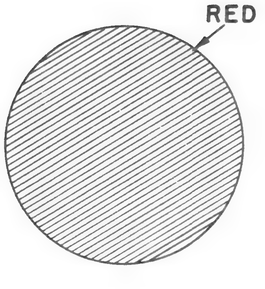
Japan was late in selecting a national insignia, waiting until World War I in Europe had proved the value of aircraft markings. Early military aircraft carried no national markings of any type. By 1913 Army aircraft were identified by a large serial number on the rudder. These numbers were assigned in numerical order as the aircraft were acquired. During this early period Naval aircraft were often marked with letter-and-number serial numbers painted across the fin and rudder identifying the naval base to which the aircraft was assigned as well as the individual serial number of the aircraft. This code used Roman letters and Japanese *Kana* characters, as well as Arabic numerals and the corresponding *Kanji* numerals with no apparent rule governing the application of either style.

In the summer of 1918 the *Hinomaru* was adopted by Imperial Decree for use by both the Japanese Army Air Force (JAAF) and the Imperial Japanese Naval Air Force (JNAF). The insignia was applied to the upper top and lower bottom wing surfaces as well as the fuselage sides with the rule of thumb that it be approximately ¾ths of the fuselage or wing chord with the wing insignia often reaching into the aileron area. No national markings were applied to the fin or rudder.

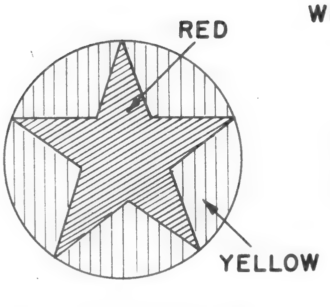
The decision to use insignia corresponded in time to the arrival in Japan of vast stocks of WWI aircraft and the subsequent introduction of camouflage and numerous insignia location variations. As a result insignia application was inconsistent with the JAAF also following French practice in placing insignia on the lower surface of the upper wing of Nieuport trainer and fighter types, as well as full chord wing insignia on a haphazard basis with other types. Some JAAF aircraft of this period on special assignment with the Army had entirely different markings consisting of a solid red fivepointed star in a solid yellow circle, with the tips of the star reaching the edge of the circle. This marking was displayed on virtually the full chord of the upper top and lower bottom wings near the tips and across the fin and rudder. The standard *Hinomaru* was retained as the fuselage marking.

While most aircraft were of natural clear or aluminum doped finish and used the solid red *Hinomaru,* camouflaged aircraft received the added marking of a thin white ring around the insignia in order to increase visibility. Within two years the original serial number markings was dropped and markings were generally restricted to the national insignia. This procedure remained in effect throughout the 1920's.

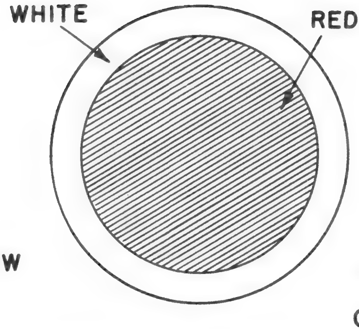
Post-World War I Naval aircraft followed suit by using identical markings, including the white outer ring on camouflaged types. Throughout the 1920's the JNAF retained its individual naval base markings, expanding



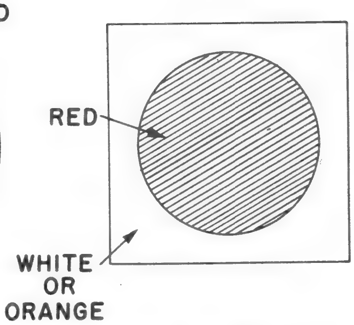
***Hinomaru* — Standard Japanese military aircraft insignia adopted in 1918.**



Red star on yellow field—Japanese Army "Star" symbol insignia used by JAAF aircraft in 1919.



White outlined *Hinomaru* — Standard Japanese military aircraft insignia 1918-1945.



***Hinomaru* applied over white or yellow panel—widely used during Pacific War 1941-1945.**

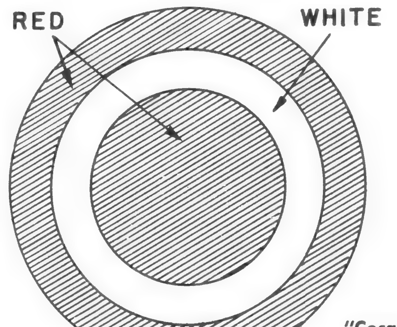
the system to include aircraft carriers as they were added to the fleet. *Kana* identification characters were assigned to each carrier, with the code also using the individual aircraft serial number. In addition to the national insignia, carrier types had their cowlings, fin and rudder painted red whenever possible in order to make the aircraft easy to spot in the event it was forced down at sea.

With the growth of Japanese militarism in the early 1930's a new marking began to be applied to many JAAF types in addition to the national insignia, making its first appearance at a JAAF dedication ceremony on November 10, 1931. Known as the Army *Aikoku* and Navy *Hokoku* ("Patriotism") inscriptions, they were the result of aggressive solications of funds from private and commercial groups for the purchase of aircraft as part of the continuing rearmament program. Aircraft procured in this manner were marked with an individual serial number assigned by both the Army and the Navy in numerical order as these so-called "gifts" were acquired, and included a description of the group or firm donating the aircraft to the military service. JAAF *Aikoku* inscriptions were painted in bold markings on the fuselage, while JNAF *Hokoku* inscriptions were painted across the fin and rudder and frequently duplicated on the fuselage. By 1939 these markings were greatly reduced in size, ultimately appearing on both Army and Navy aircraft as small inscriptions on the fuselage just forward of the stabilizer. They remained in use throughout the Pacific War period until the last few months of the war.

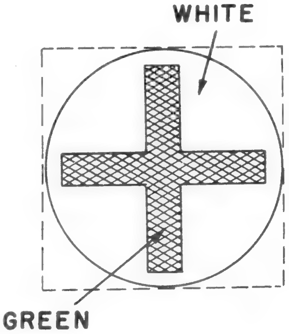
Late in 1938 the "Combat Identification Stripe" made its appearance on aircraft operating in China in order to facilitate rapid recognition of friendly aircraft by Japanese ground troops as well as by other aircraft (a technique later employed by the Allies for the 1944 invasion of Europe). This took the form of a white or yellow band approximately 20 inches wide around the fuselage located between the insignia and the stabilizer leading edge. This marking was dropped by the JNAF in 1941 but continued to be used on combat aircraft by the JAAF throughout the Pacific War. In place of the "Combat Stripe," the JNAF painted a large portion of the wing leading edge yellow as an identification aid. This marking was, in turn, also adopted by the JAAF and used in addition to the "Combat Stripe."

During the Sino-Japanese War the JAAF also adopted a new form of aircraft heraldry, the individual squadron and training command insignia. These colorful markings gained widespread popularity in the 1940-1941 period until virtually every JAAF type in service had some form of unit device on the vertical tailplane. In general, training command markings appeared on the rudder only, with squadron markings taking up both fin and rudder. There were exceptions to this rule. These markings were used throughout the Pacific War and apeared on Army aircraft in every theater of operations.

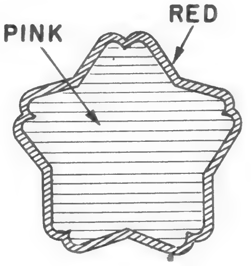
While the Army proudly proclaimed individual units and schools by bright markings, the JNAF was somewhat more secretive about their aircraft. The letter-and-number code used since 1913 remained in use until WW2. Shortly before the Pearl Harbor attack this system was



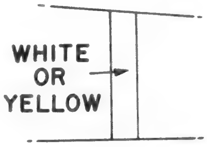
"Cocarde" *Hinomaru*—variation of standard insignia as used by JAAF Home Defense Squadron in 1945.



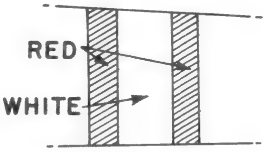
"Surrender Cross" — a green cross on a white field. Field could be square, circular or the entire aircraft.



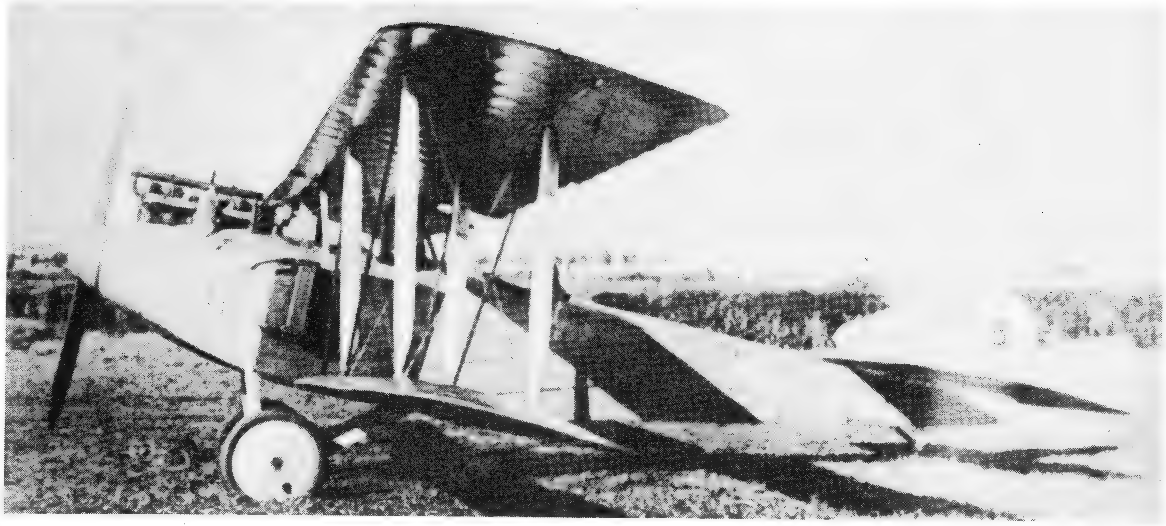
Red and pink "Cherry Blossom" insignia adopted by Japanese National Safety Force prior to reorganization as JGSDF.



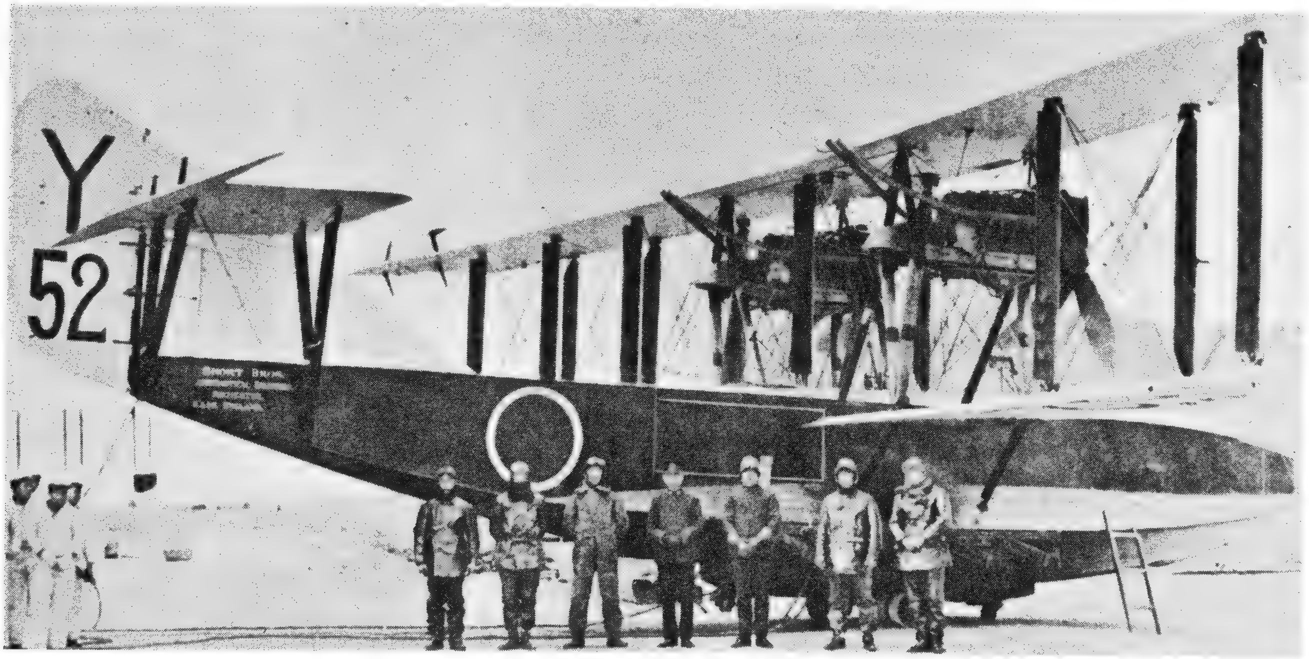
White or yellow "Combat Stripe" adopted during Sino-Japanese "Incident"—used by both JNAF and JAAF, and with the latter throughout the Pacific War.



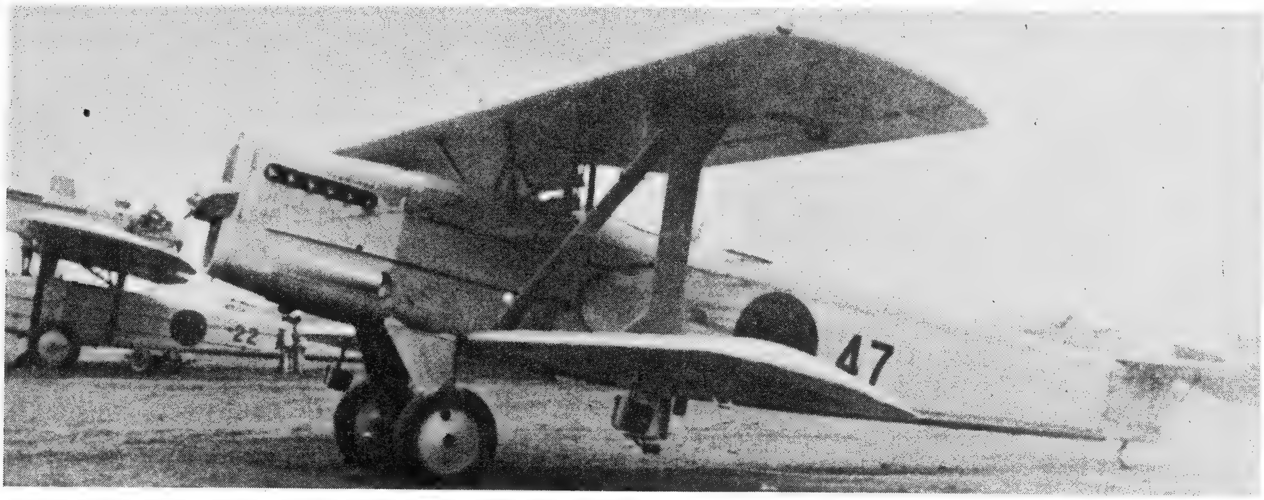
Red and white Wartime Civil Stripes as applied to all civil aircraft during Pacific War period.



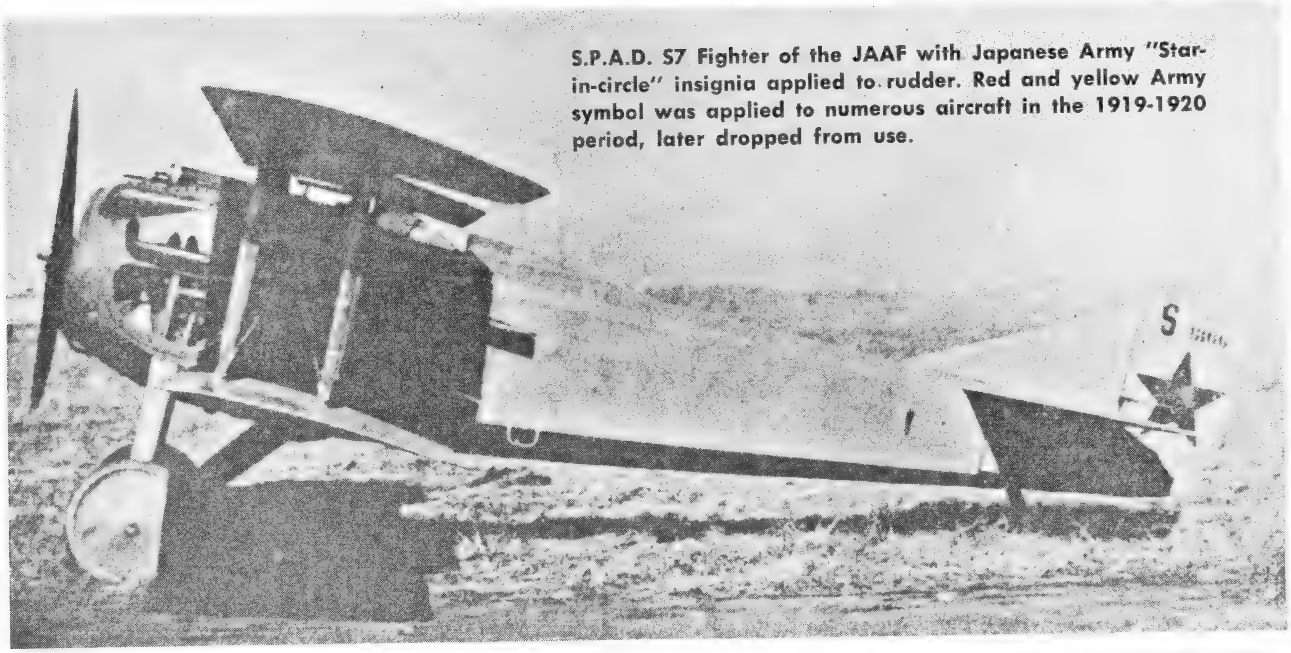
Nakajima Type 5 Reconnaissance Biplane with early JAAF serial number identification appearing on rudder. No national insignia is used. Manufacturer's name and aircraft duty was also painted on the rudder in Kanji characters.



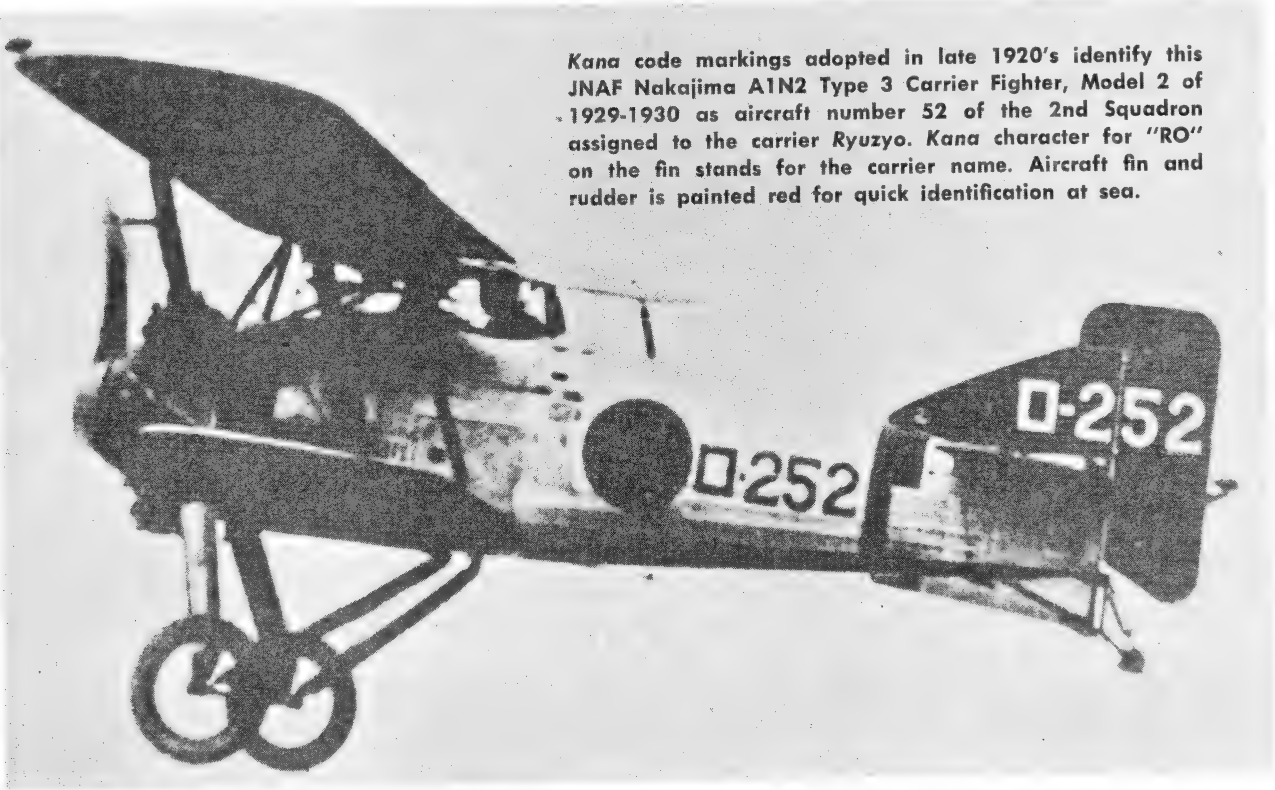
JNAF Short F-5 "America" Class Reconnaissance Flying Boat of 1921 with Navy letter-and-number identification. "Y-52" marking on rudder indicates aircraft is number "52" assigned to Yokosuka Naval Air Base, the latter identified by the letter "Y". A white outlined *Hinomaru* appears on the fuselage.



Standard JAAF markings during the 1920's as applied to Kawasaki Type 88-I Light Bomber (foreground) and Kawasaki Type 87 Heavy Bomber (background). Individual aircraft number in squadron appeared in black on the light gray fuselage. Plain red *Hinomaru* was used on light colored aircraft. Aircraft designation on rudder in Kanji.

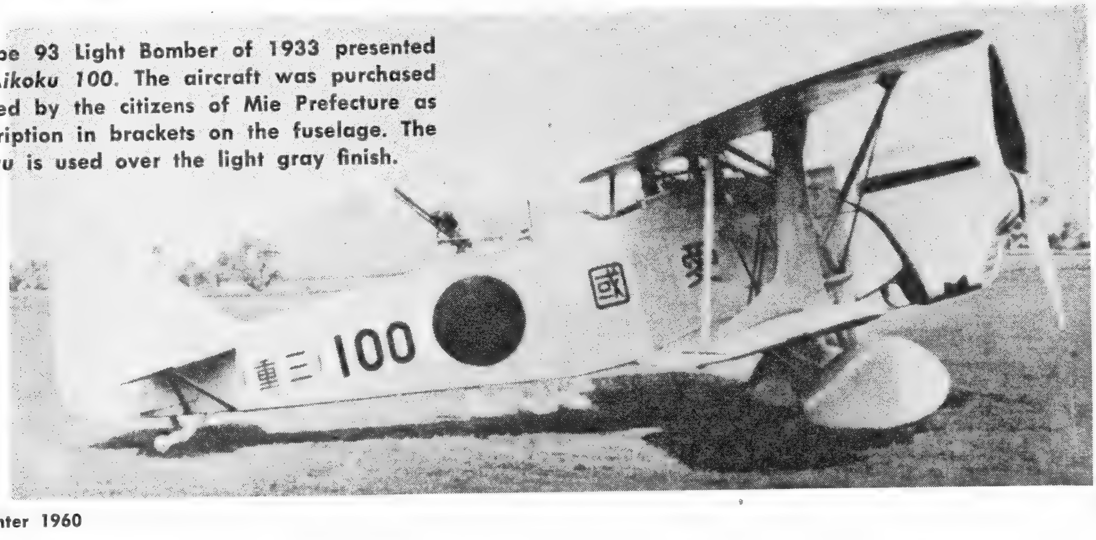


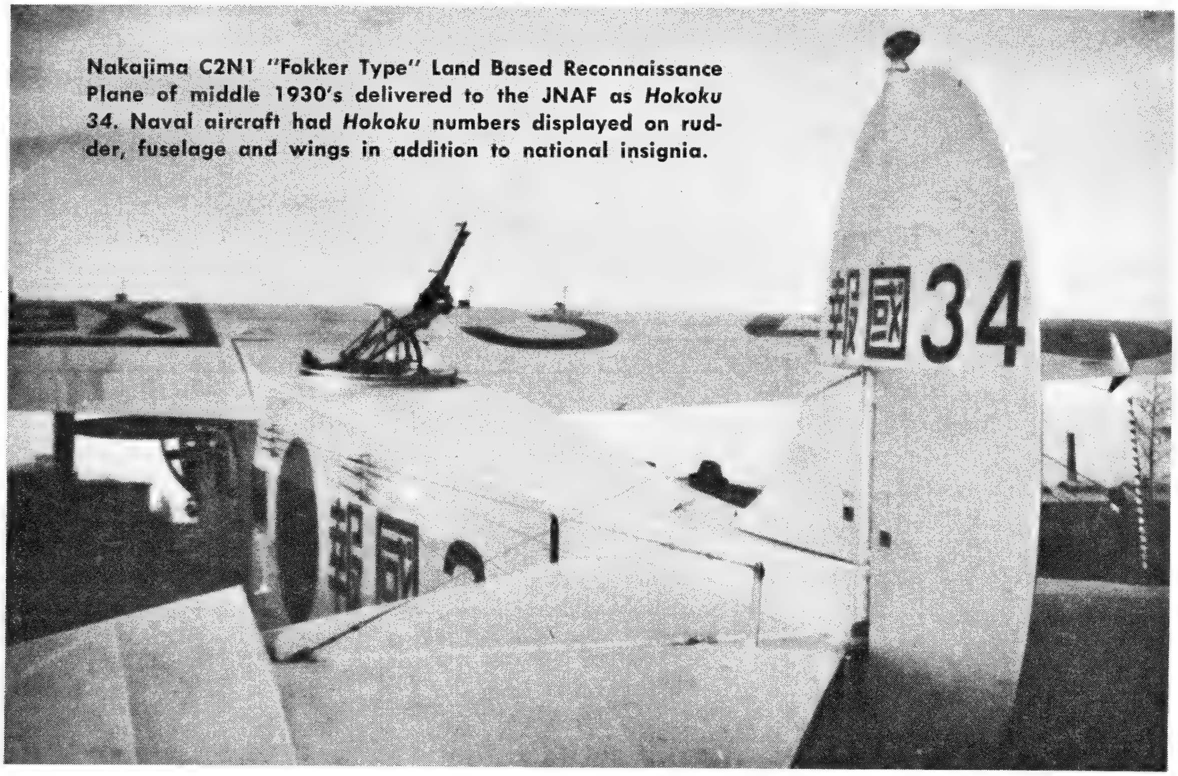
S.P.A.D. S7 Fighter of the JAAF with Japanese Army "Star-in-circle" insignia applied to rudder. Red and yellow Army symbol was applied to numerous aircraft in the 1919-1920 period, later dropped from use.



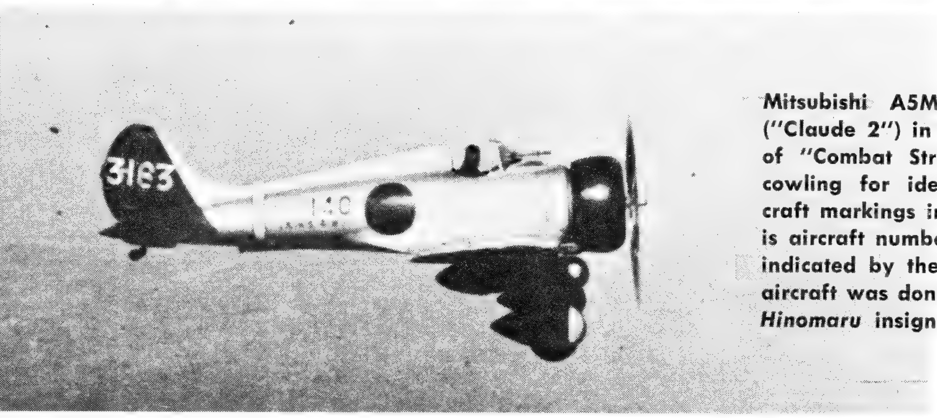
Kana **code markings adopted in late 1920's identify this JNAF Nakajima A1N2 Type 3 Carrier Fighter, Model 2 of 1929-1930 as aircraft number 52 of the 2nd Squadron assigned to the carrier *Ryuzyo*. *Kana* character for "RO" on the fin stands for the carrier name. Aircraft fin and rudder is painted red for quick identification at sea.**

Kawasaki Ki.3 Type 93 Light Bomber of 1933 presented to the JAAF as *Aikoku 100*. The aircraft was purchased with funds collected by the citizens of Mie Prefecture as noted on the inscription in brackets on the fuselage. The plain red *Hinomaru* is used over the light gray finish.





Nakajima C2N1 "Fokker Type" Land Based Reconnaissance Plane of middle 1930's delivered to the JNAF as *Hokoku 34*. Naval aircraft had *Hokoku* numbers displayed on rudder, fuselage and wings in addition to national insignia.



Mitsubishi A5M2a Type 96 Carrier Fighter, Model 2 ("Claude 2") in service in China in 1938 shows JNAF use of "Combat Stripe." Aircraft had red tail surfaces and cowling for identification. Squadron and individual aircraft markings in white across fin and rudder indicate this is aircraft number "163" of the 12th Air Group, the latter indicated by the number "3". *Hokoku 140* markings note aircraft was donated by a Mr. Arimoto of Osaka. Plain red *Hinomaru* insignia is used.

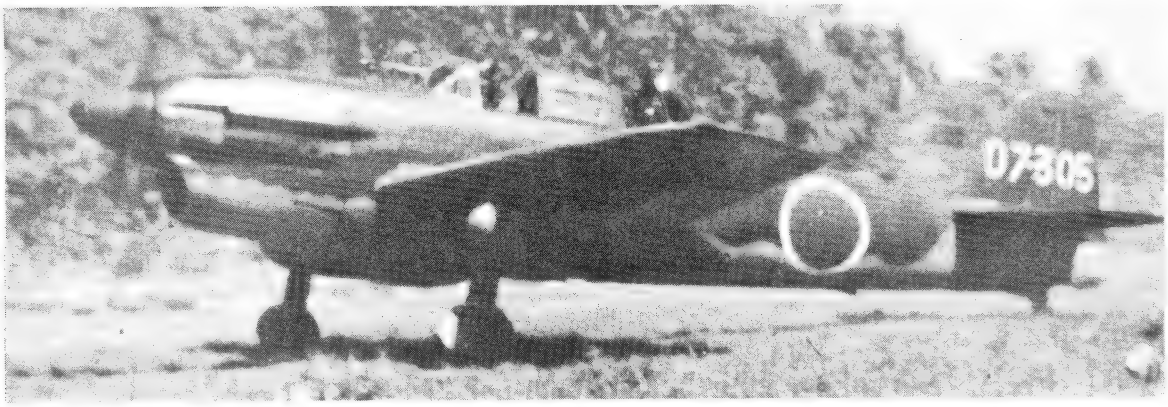
revised to identify Naval Air Fleets and their carriers by Roman letters with Arabic numerals used to denote the squadron and individual aircraft number. In August 1943 this system was also revised to the "call number" code for combat aircraft in which a prescribed series of Arabic numerals was used to describe the aircraft duty and home base, followed by a hyphen and numerals denoting the squadron and individual aircraft number. In some cases the numerical order was reversed. These "call numbers" were painted across the fin and rudder in white or yellow for easy visibility. The initial series of digits were based on the following identification code:

100 Series—Land based reconnaissance aircraft
200 Series—Land based shipboard fighters (a special class initiated in late 1943 following the loss of virtually all Japanese aircraft carriers)
300 Series—Land-based interceptor and night fighters
400 Series—Float and land-based reconnaissance aircraft
500 and 700 Series—Land-based bombers
600 Series—Shipborne catapult aircraft
800 Series—Float and flying boat reconnaissance aircraft
900 Series—Float reconnaissance aircraft
1000 Series—Land-based and flying boat transport aircraft

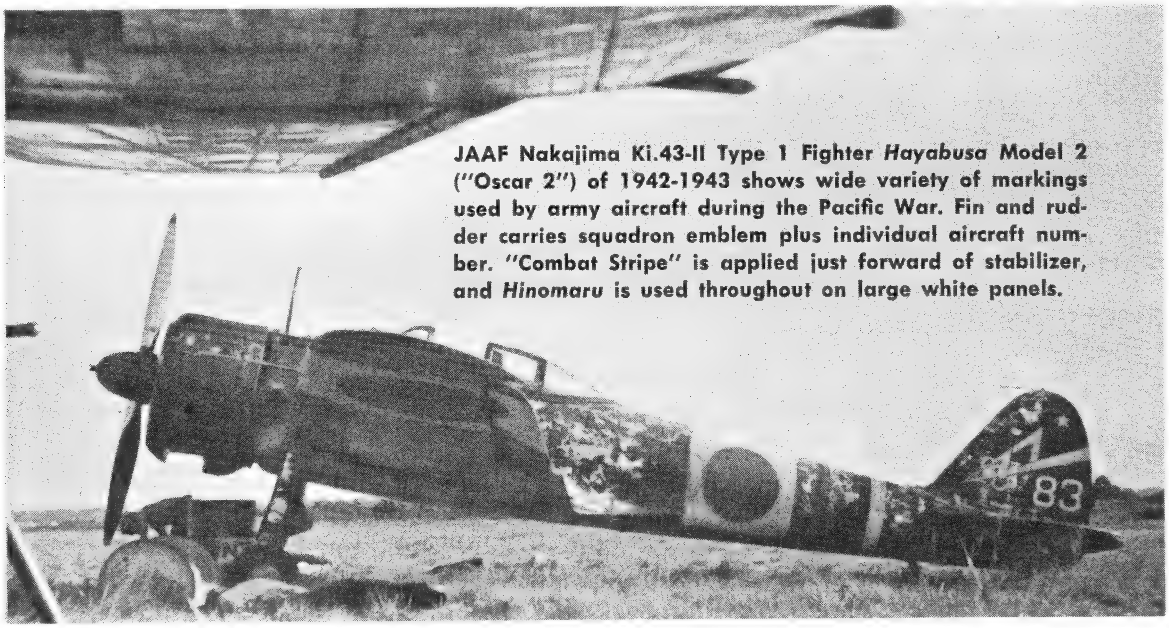
Non-combatant aircraft, such as trainers, service-test and experimental types, used a seperate code system consisting of a *Kana* character denoting the aircraft's home station, followed by a dash and a number or number-and-letter combination identifying the function and serial number of each aircraft.

Use of the *Hinomaru* during the Pacific War was restricted to four major variations, with each type in use from the opening day of the war. The solid red Meatball was often supplemented by an insignia outlined with a white, light gray or yellow outer ring approximately two inches wide, or by application of the insignia directly over wide white or orange-yellow panels on the fuselage and wing. Both JAAF and JNAF aircraft frequently made use of two or three of these insignia variations on the same aircraft in order to gain maximum visibility. In the last few months of the war additional variations made their appearance in some squadrons. Home Defense Squadrons, for instance, had their wing tips painted red. One Home Defense Squadron, operating in the vicinity of Kiru in the summer of 1945, had an additional red ring painted around the white outline *Hinomaru* to give a wide cocarde effect. One JAAF air-to-air *Kamikaze* suicide attack squadron dropped the national insignia entirely in order to paint their aircraft jet black, with the sole markings consisting of white eagles on the wings and fuselage. These individualized examples were rare and never officially sanctioned.

Defeat of Japan in the Pacific finally changed the national insignia, although this change was dictated by the victorious Allies rather than the Japanese. With a keen insight into Japanese character, the Allied Surrend-



Hiro D4Y2-S *Suisei-E* Night Fighter modification of JNAF *Suisei* 2 ("Judy 2") Dive Bomber shows use of "Call Number" code on fin and rudder. System was adopted late in 1943. Number "305" indicates aircraft is a night fighter, number "07" notes it is 7th aircraft in the squadron. Portion of leading edge is painted yellow for easy identification. White outlined *Hinomaru* is used on fuselage, plain red insignia on wings.



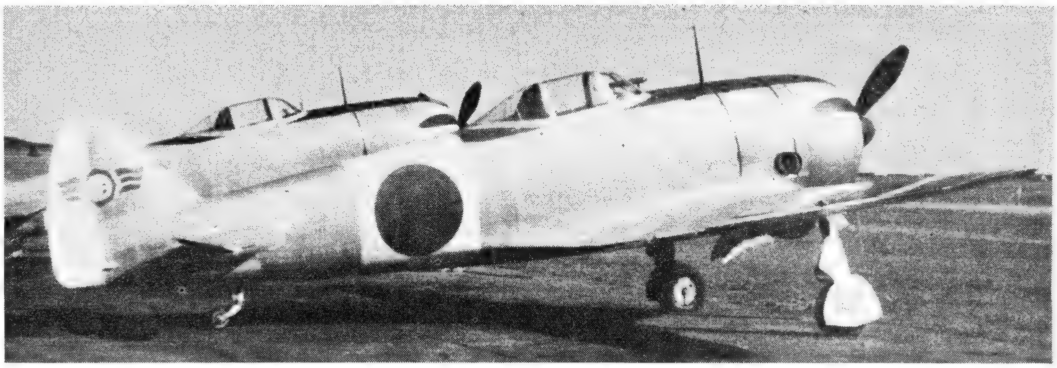
JAAF Nakajima Ki.43-II Type 1 Fighter *Hayabusa* Model 2 ("Oscar 2") of 1942-1943 shows wide variety of markings used by army aircraft during the Pacific War. Fin and rudder carries squadron emblem plus individual aircraft number. "Combat Stripe" is applied just forward of stabilizer, and *Hinomaru* is used throughout on large white panels.

er Commission instructed the Japanese to mark all servicable aircraft with green "surrender" crosses on a white field. The marking took three forms; a white circle or square over the existing insignia, with the green cross centered in the field, or painting of the entire aircraft white with crosses located on the fuselage sides and on the wings, and in a few examples, across the fin and rudder. Few aircraft were flown with this marking as most servicable types were soon marked with the insignia of the capturing Allies. A number of transport and converted bomber types were retained for Japanese service, however, and the "surrender" cross marking remained in use during the surrender negotiations and a number of months afterward.

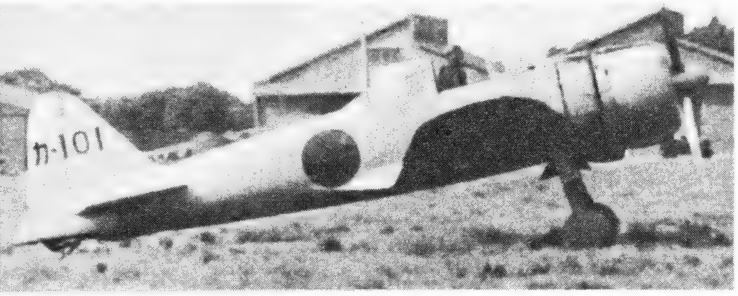
Five years after surrender the beginnings of a new Japanese air service was established under the tutelage of General MacArthur in August 1950. Known as the National Police Reserve Force, the new service was assigned former American liaison aircraft, including L-5 and L-16 types. The planes had olive drab fuselage with the wings and entire tail section from well forward of the stab's leading edge painted a bright orange-yellow. Markings consisted of the letters "NPR" for "National Police Reserve," boldly painted in orange-yellow on both sides of the fuselage and in black on the upper right and lower surfaces of the wings. The original USAF serial number was retained in black across the fin and rudder.

Early in 1953 the air service was expanded and ultimately reorganized through several name changes as the "National Safety Force." Former "NPR" aircraft remained in service without change, with new aircraft entering service with "NSR" for "National Safety Reserve," later "NSC" for "National Safety Corps," and finally "NSF" for "National Safety Force." The new markings were located in the same manner as the former "NPR" markings. In the summer of 1953 the solid red *Hinomaru* made its first post-war appearance by being used on the upper left and lower right wing surfaces. By December of 1953 the former lettering had been completely dropped with new aircraft entering service with the meatball on all four wing surfaces. New insignia replaced the lettering on each side of the fuselage, taking the form of a stylized Cherry Blossom in solid cherry-pink outlined in red. Procurement serial numbers were retained, only now they were moved to the after fuselage leaving no markings on the fin and rudder. Ultimately the "NSF" aircraft were painted either solid olive or orange-yellow with markings remaining the same.

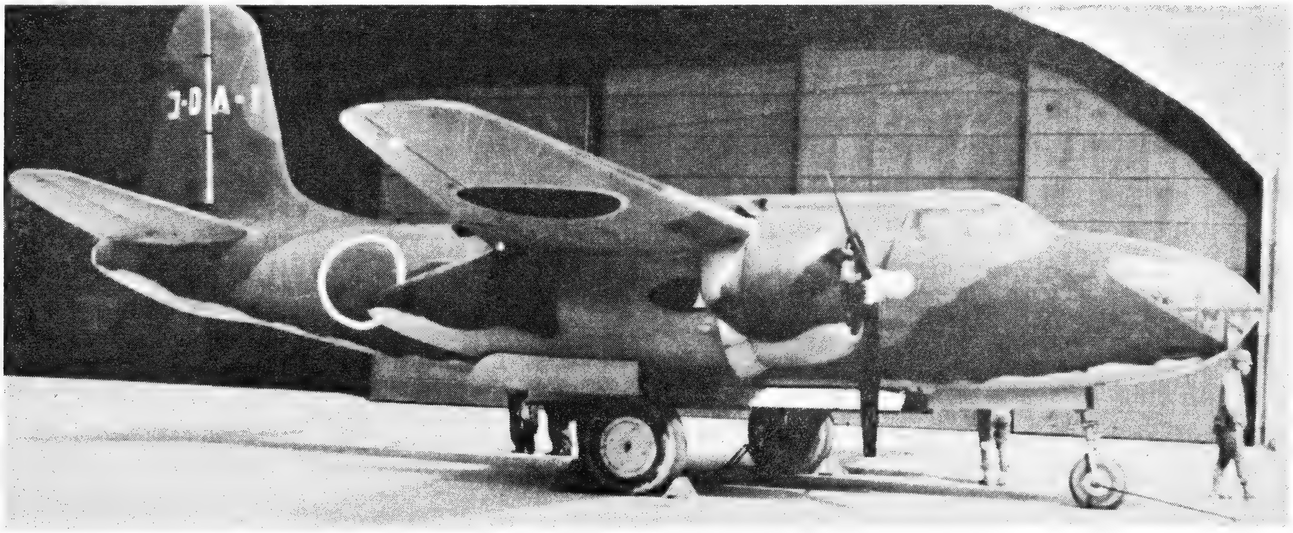
On July 1, 1954 the Japanese Self Defense Forces were officially established to include the Air Self Defense Force (JASDF), the Maritime Self Defense Force (JMSDF), and the Ground Self Defense Force (JGSDF), the latter including the earlier "National Safety Force." The familiar *Hinomaru* was adopted for all three air services, and is generally used with a white outline ring, although the plain red insignia is sometimes seen. JASDF and JGSDF aircraft carry procurement serial numbers across the fin and rudder in USAF style, while JMSDF aircraft have returned to the old pre-war JNAF policy of identifying the aircraft home base with a *Kana* character with the individual aircraft serial number in Arabic numerals.



Nakajima Ki.44-II Type 2 Fighter *Shoki* Model 2 ("Tojo 2") of wartime JAAF Training Command carries black and white winged insignia of the Akeno Fighter Training School across fin and rudder. *Hinomaru* is applied over white panels on natural metal finish. Note absence of "Combat Stripe" on this non-combatant JAAF aircraft.

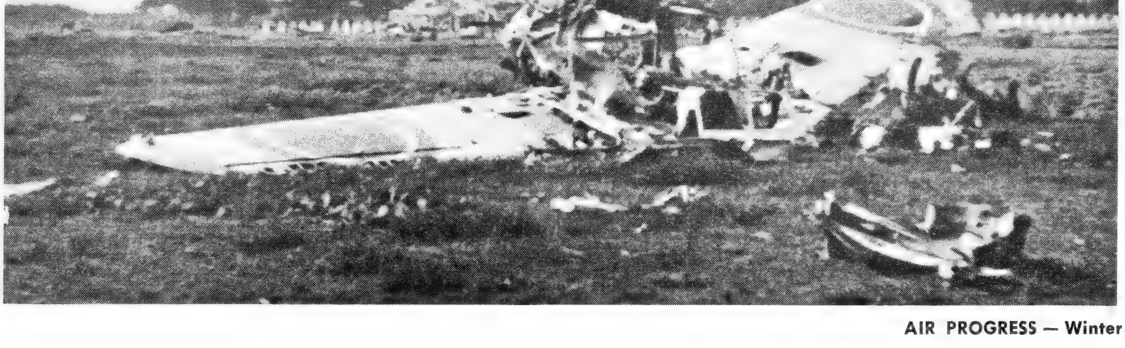


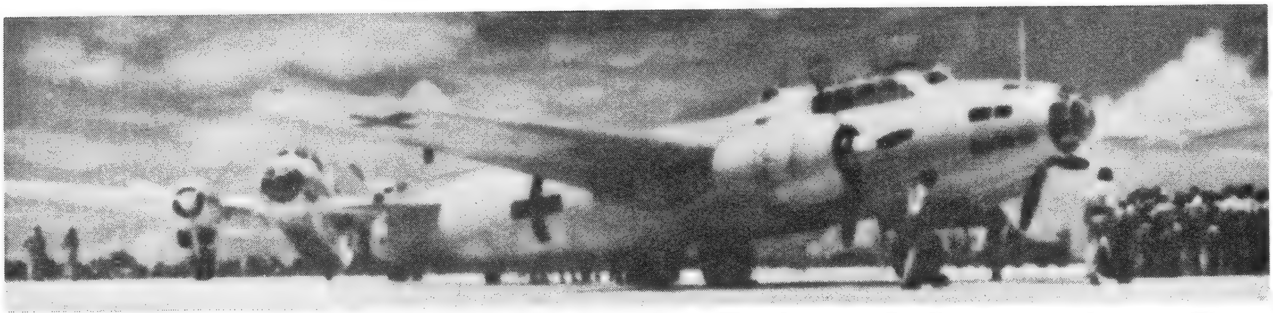
Early JNAF Mitsubishi A6M2 Type 0 Carrier Fighter, Model 21 ("Zeke 21") with identification code used at beginning of the Pacific War, circa 1940-1941. Markings on the fin and rudder using *Kana* character "KA" indicate this is Kasumigaura Naval Air Base aircraft No. 101 stationed at the JNAF's leading wartime flight training school.



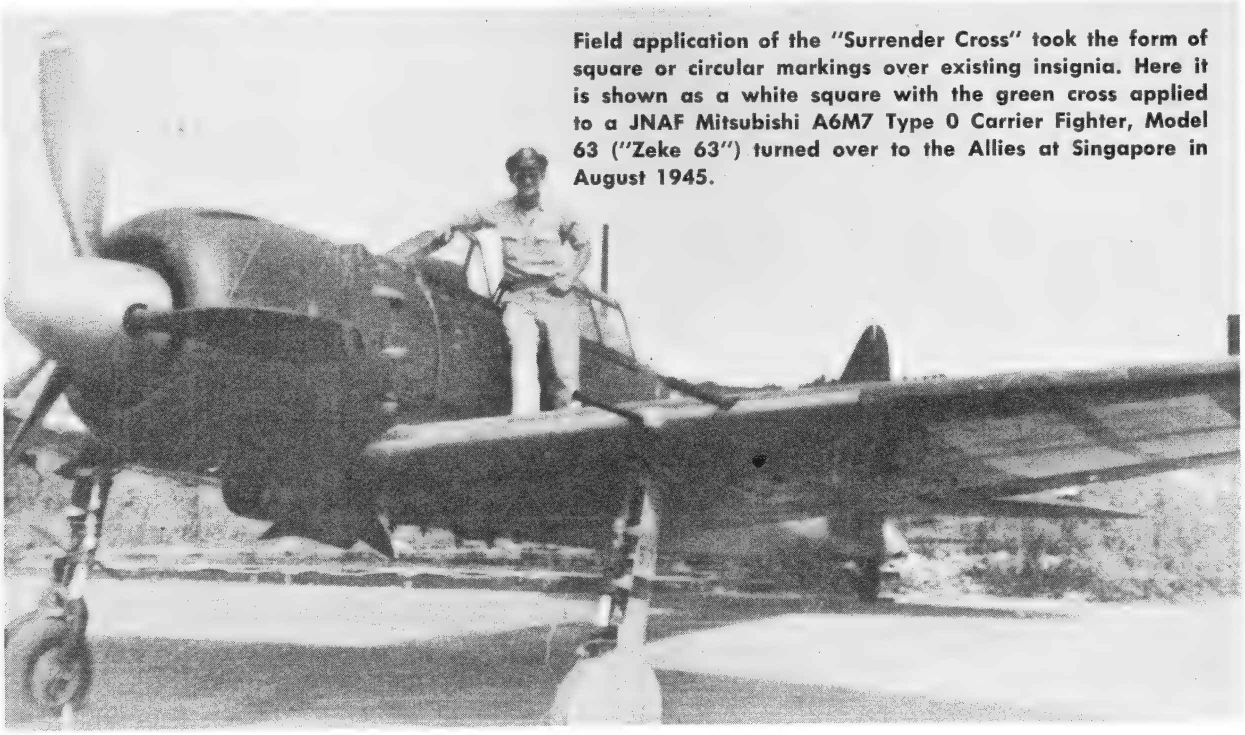
Captured Douglas A20-A *Havoc* under test during the war at the Yokosuka Air Arsenal shows use of *Kana* non-combatant aircraft markings adopted by the JNAF in 1943. Code on fin and rudder uses character for "KO" to denote *Kukugizitsusho*, or "research aircraft." Letters "DA" indicate "Douglas Attack" and "1" notes it is the first tested.

Wreckage of home defense Nakajima Ki.84 Type 4 Fighter *Hayate* ("Frank") showing use of Home Defense red wing tips and unique cocarde insignia. Squadron of *Hayates* was stationed at Kiru, Japan in summer of 1945 and was only unit using this insignia with the additional red circle around the white ringed *Hinomaru*.

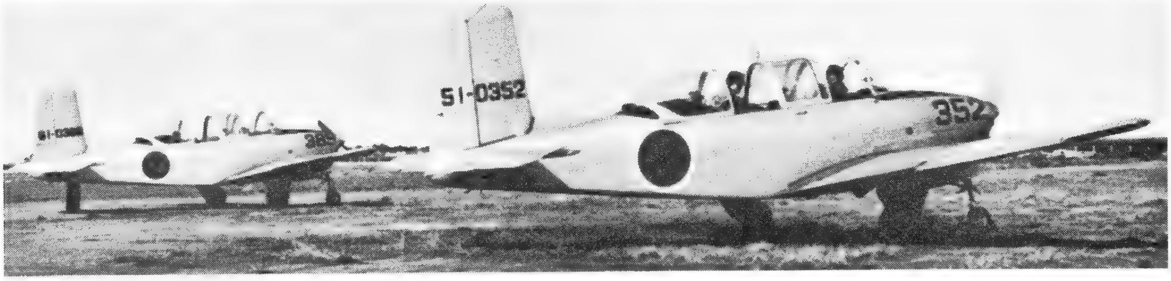




First use of the "Surrender Cross" appeared on two JNAF Mitsubishi G4M1 Type 1 Land Attack, Model 1 ("Betty 1") bombers converted to transports and flown to Ie Shima on August 19, 1945, with the Japanese surrender delegation. These aircraft were painted white overall with green crosses on wings, fuselage and vertical tail.

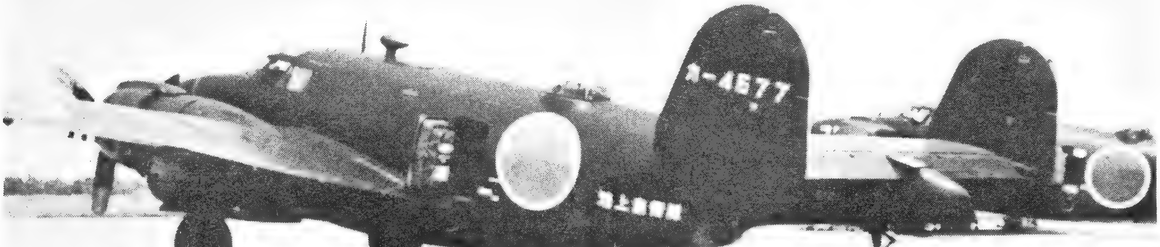


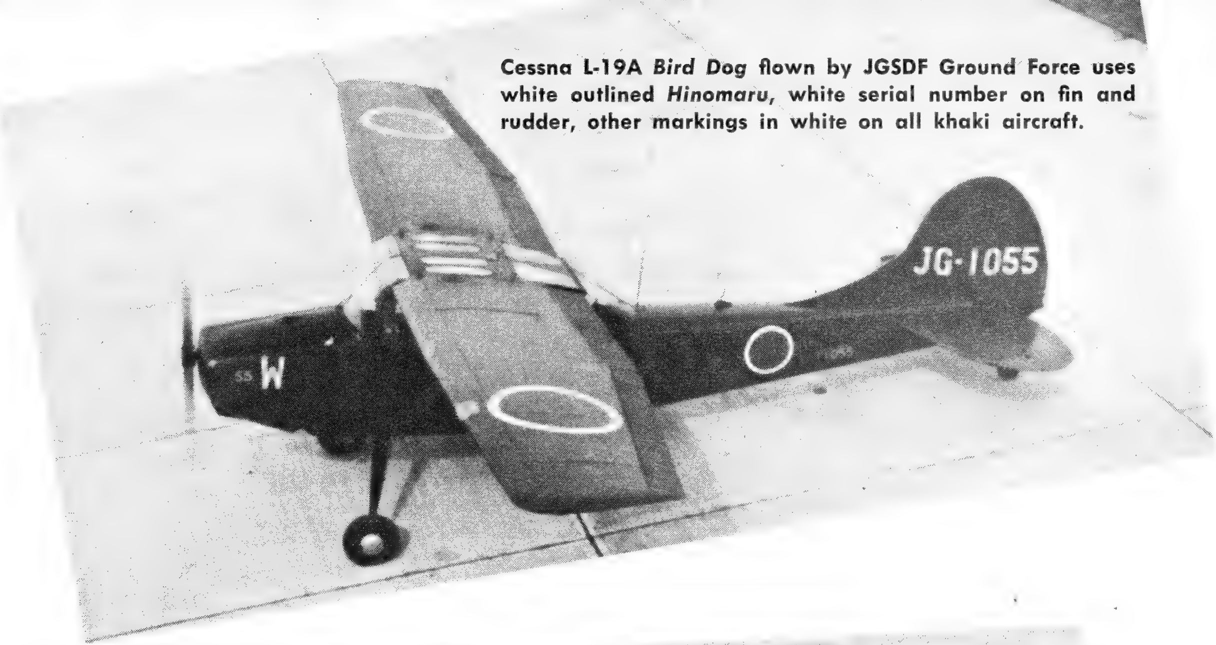
Field application of the "Surrender Cross" took the form of square or circular markings over existing insignia. Here it is shown as a white square with the green cross applied to a JNAF Mitsubishi A6M7 Type 0 Carrier Fighter, Model 63 ("Zeke 63") turned over to the Allies at Singapore in August 1945.



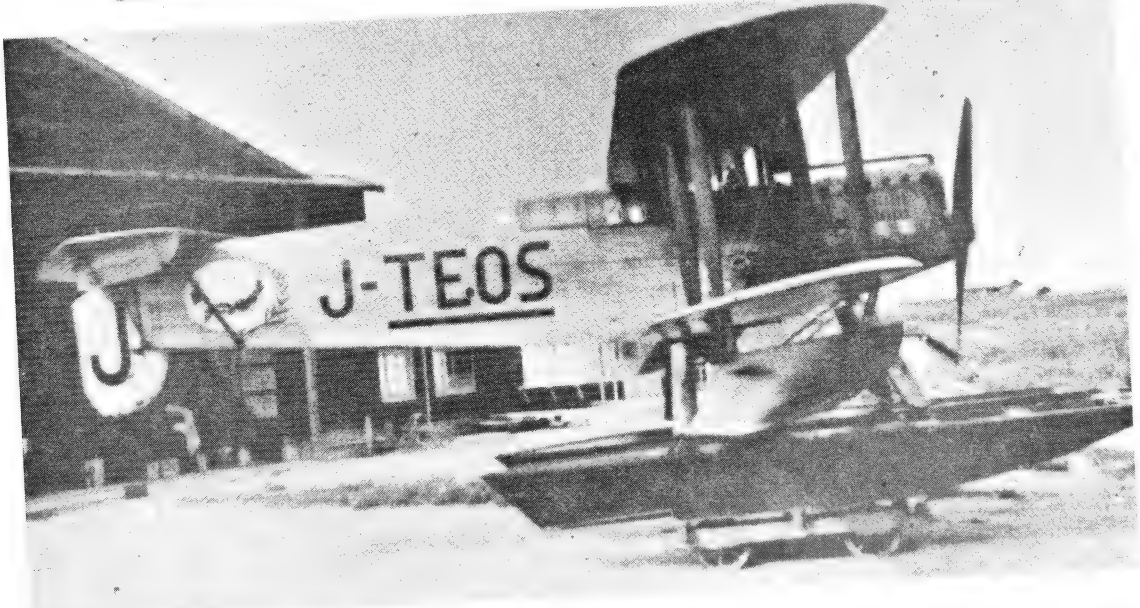
Fuji produced Beech T-34A *Mentor* trainers of the JASDF show use of serial number across fin and rudder and white outlined *Hinomaru*. Last three digits of serial number are repeated on nose of aircraft as flash number. These trainers are currently stationed at Oita Airfield, Japan.

Lockheed PV-2 *Harpoon* of the JMSDF Maritime Force is painted midnight blue overall with white outlined insignia. Identification code across fin and rudder uses *Kana* character for "KA" to denote Kanoya Air Base. This is followed by squadron and aircraft number.



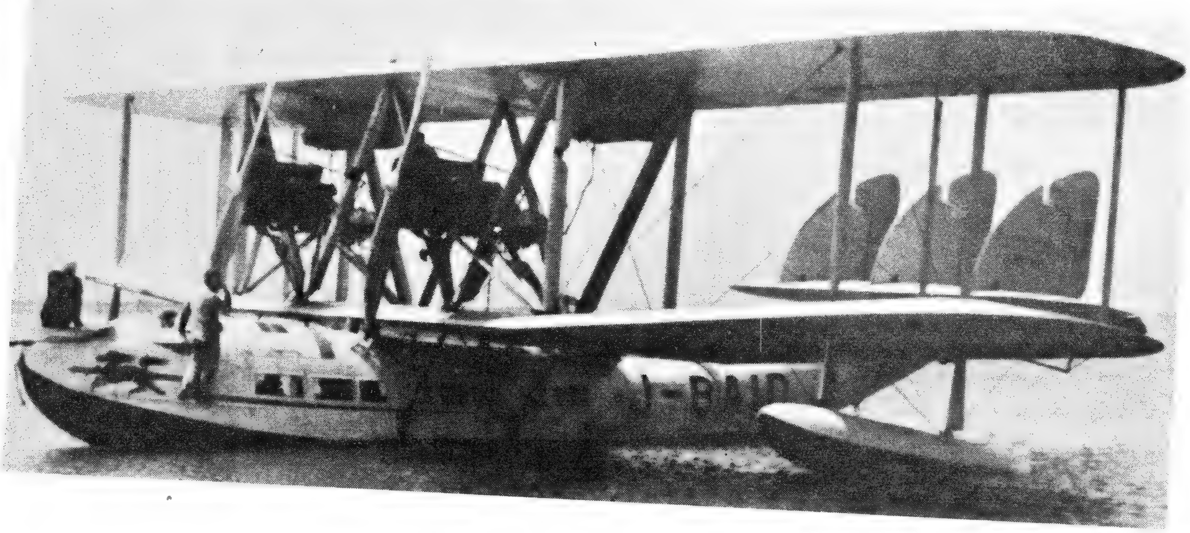


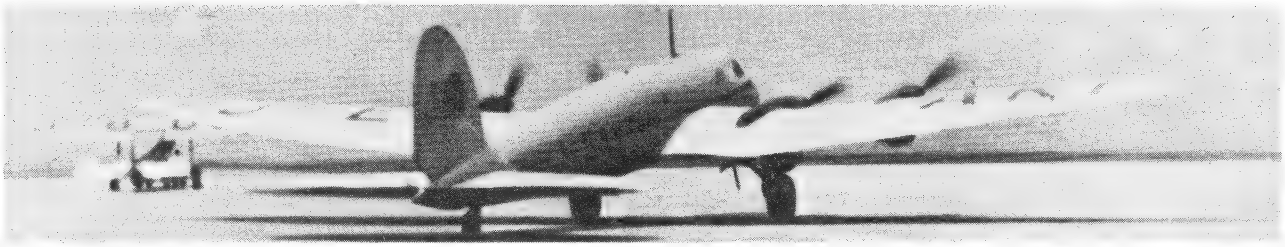
Cessna L-19A *Bird Dog* flown by JGSDF Ground Force uses white outlined *Hinomaru*, white serial number on fin and rudder, other markings in white on all khaki aircraft.



Kawanishi 6 seaplane transport of 1924 shows early post-war markings underlined in manner similar to then current Italian practice. J-*TEOS* set flight record in July 1924. Map of route appears on rear fuselage. National letter "J" is on rudder and elevators.

Standard Japanese civil markings circa 1936 on Supermarine "Southampton" Passenger Transport J-BAID operated by Japan Air Transport Research Organization. Geographic registration letter "B" indicates aircraft was based in Japan proper. Airline insignia appears on nose. National letter "J" is applied to outside rudder and elevator surfaces.





Heinkel He.116A Passenger Transport of Japan Air Transport Company as it entered service in spring 1938. The *Hinomaru* is applied to wings and fin. Civil registration J-EAKF shows aircraft was based in Manchuria as noted by geographic letter "E". Registration letter "J" also appears on the rudder and elevators.

CIVIL MARKINGS

Prior to and during World War I Japanese civil aircraft had no standard markings. Identification was limited to factory insignia and serial numbers. After the war civil markings followed standard world practice as established at Versailles in 1919, with the national letter "J" followed by a dash and a four letter registration. The full registration appeared on both sides of the fuselage as well as the exposed upper and lower wing surfaces. The four letter portion of the registration was underlined in a manner similar to that of contemporary Italian practice. The national registration letter also appeared on each side of the rudder and the upper and lower surfaces of the stabilizer and elevator. These markings remained in effect until well into the Pacific War period with the exception of the underlining which was dropped in the early 1930's, with a few exceptions to this in service up to the war period.

In 1927 civil registration assignment was revised to denote the geographic area in which the aircraft was based. Initial J-T# # #, J-C, J-C# # # and J-K# # # registration series of the post-WWI period did not follow this practice, but with the asignment of new registrations the first letter of the series following the national letter "J" was used as the area identification, as follows:

J-A# # # Series—Japanese home islands—Government (Aircraft owned or operated by Japanese government agencies or organizations)
J-B# # # Series—Japanese Home Islands—Private (Aircraft owned or operated by agencies or organizations other than the Japanese government)
J-C# # # Series—Korea
J-D# # # Series—Formosa
J-E# # # Series—Southern Manchuria

This system remained in use throughout the Pacific War.

In 1938, following Japanese involvement in China, all transport aircraft as well as numerous other civil types, were marked with the *Hinomaru* on the upper and lower wing surfaces outboard of the civil registration. During this period transports flying routes to or over the Chinese mainland were camouflaged in military style with the national insignia appearing more prominently than the civil registration.

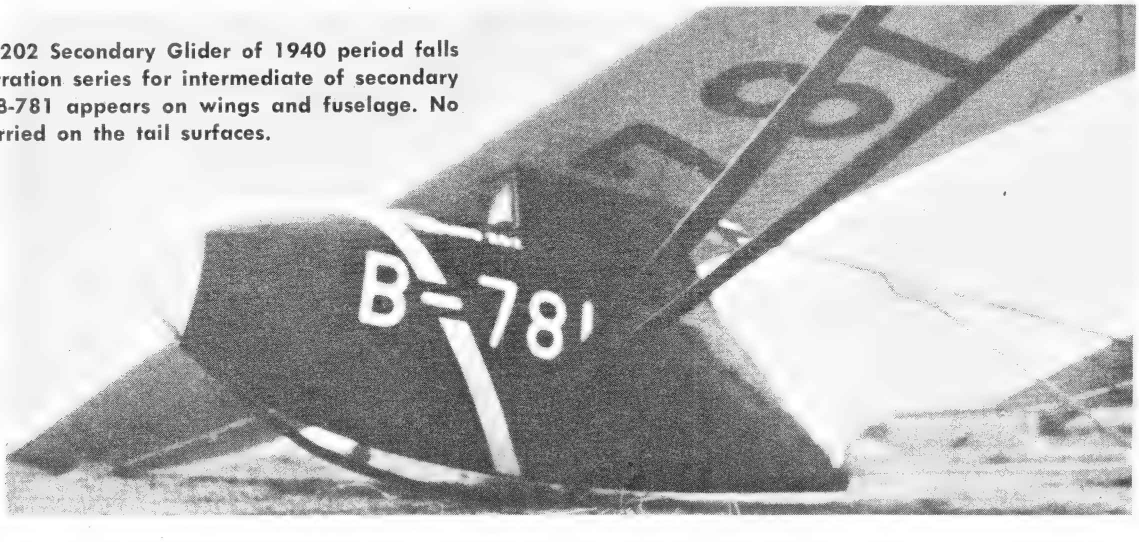
Glider registrations, up to 1937 identical to civil aircraft registrations, were changed ofter Japan's entry into the Sino-Japanese "incident." Gliders were thereafter assigned a Roman letter designating the class of glider, followed by a dash and a numerical registration of from one to four numbers. Registration was assigned on the following basis:

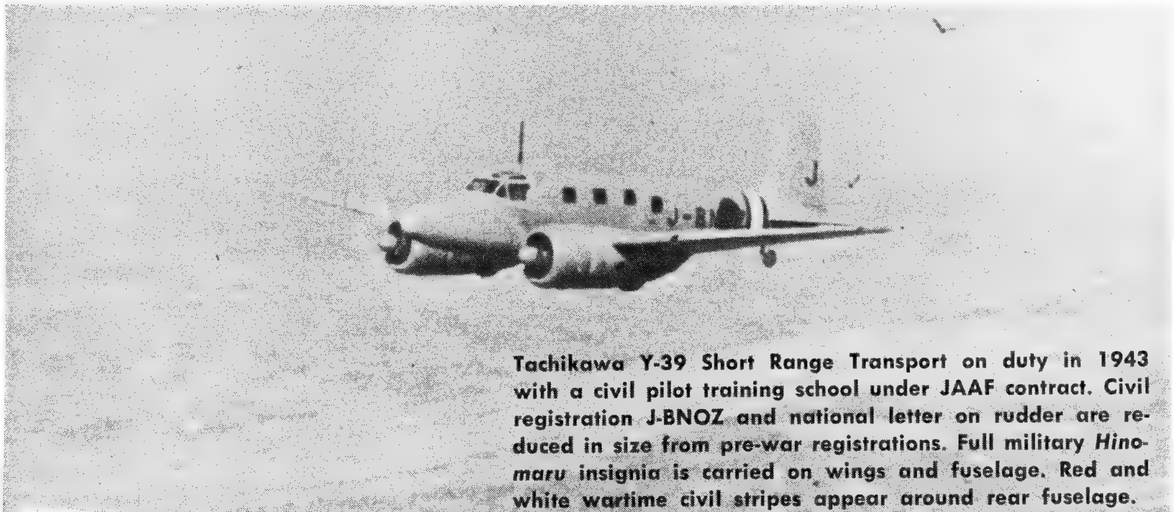
A-# # # Series—Sailplanes
B-# # # Series—Primary Gliders
C-# # # Series—Secondary Gliders
D-# # # Series—Experimental Gliders

In late 1940 all civil aircraft, including gliders, received additional markings known as the "wartime civil stripes." Designed to aid rapid identification of friendly aircraft, the stripes consisted of a wide white band on the after fuselage just forward of the tail section edged by smaller red bands on each side. An additional red stripe was painted the entire length of the underside of the fuselage. As the Pacific War progressed the civil registrations were decreased in size while the national insignia was greatly enlarged. By late 1944 the civil registration had all but disappeared, having been dropped entirely with the exception of a small registration on the after fuselage, Military camouflage and markings were by then extensively used as virtually all transport and other civil types were taken over by the military for V.I.P. and troop transport uses. By 1945 the only sure way to identify a civil type was the "wartime civil stripes." With the Japanese defeat the "surrender" cross was also applied to the few civil aircraft that survived the war and were in use under Allied permission.

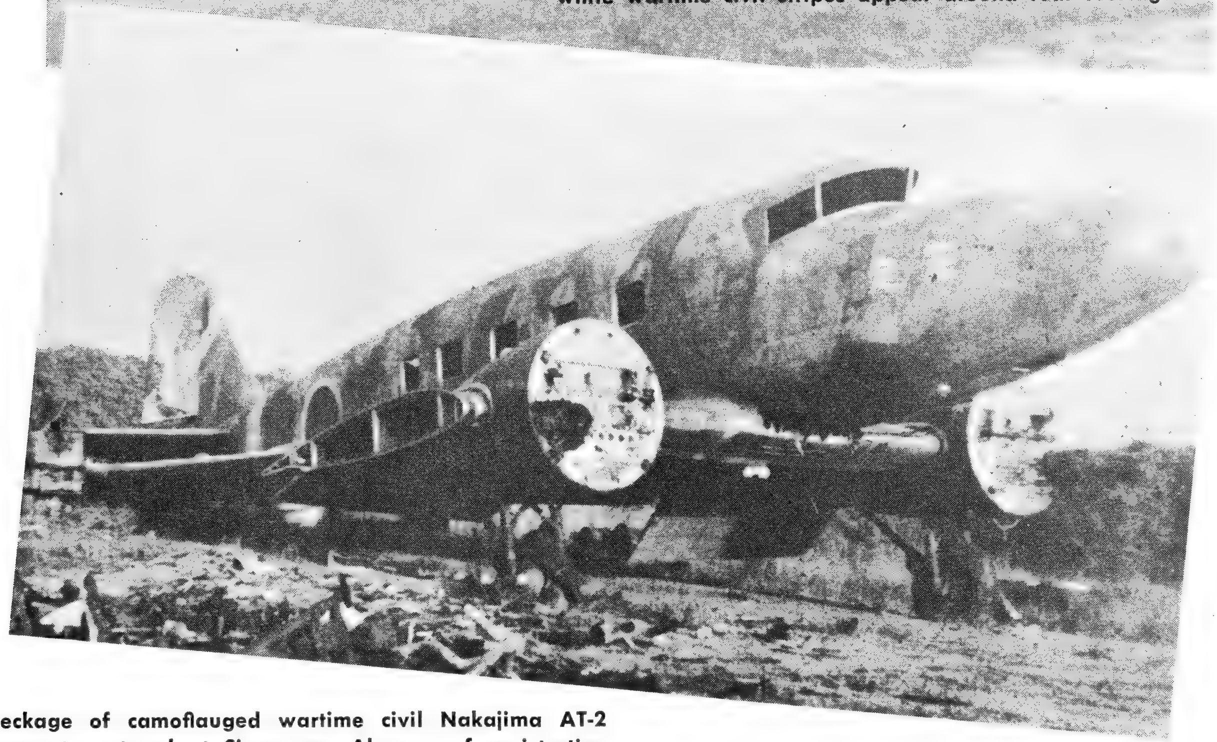
With the post-war rebirth of civil aviation in Japan an entirely new registration system has been adopted for powered aircraft, helicopters and gliders. Identification consists of the national letters "JA" followed by a four digit registration number. This registration is painted on the upper right and lower left surfaces as well as horizontally or vertically on the fin and rudder—or alternatively, horizontally across the fuselage. The deHavilland "Beaver" aircraft and Sikorsky helicopters operating with Japan's Geophysical Year Antarctic Expedition had additional national markings in the form of reproductions of the Japanese flag; a red *Hinomaru* in a rectangular white field on the upper left and lower right wingtips and on the helicopter fuselage sides, plus a plain red meatball on the fuselage of each aircraft.

Pre-war Mizuno 202 Secondary Glider of 1940 period falls under "B" registration series for intermediate of secondary gliders. License B-781 appears on wings and fuselage. No markings are carried on the tail surfaces.



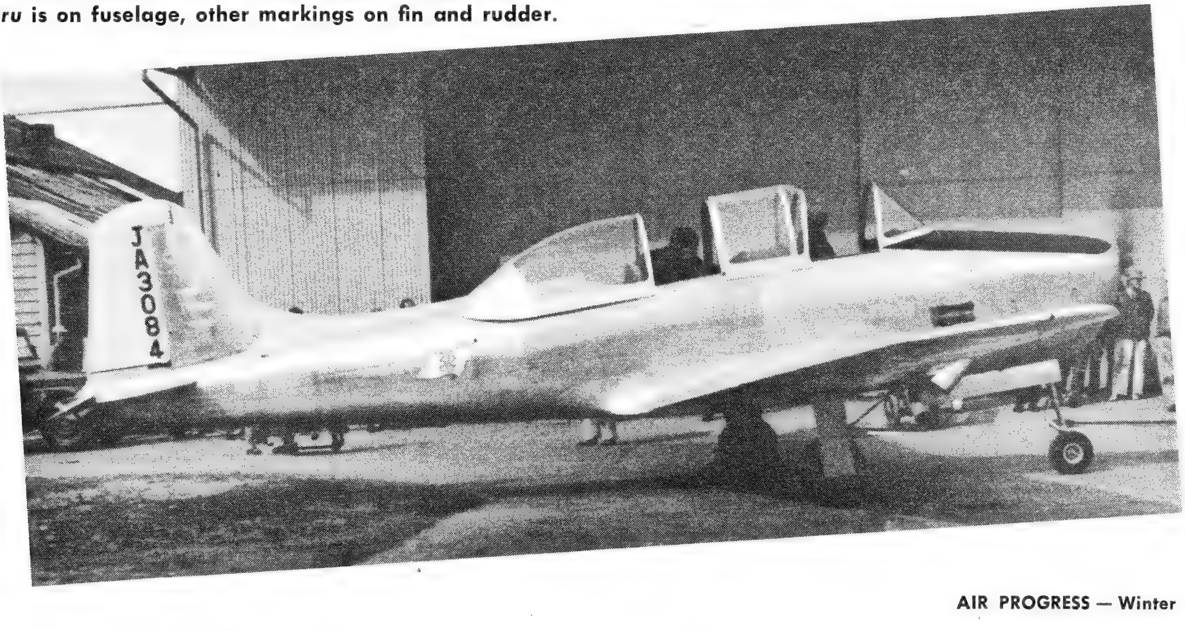


Tachikawa Y-39 Short Range Transport on duty in 1943 with a civil pilot training school under JAAF contract. Civil registration J-BNOZ and national letter on rudder are reduced in size from pre-war registrations. Full military *Hinomaru* insignia is carried on wings and fuselage. Red and white wartime civil stripes appear around rear fuselage.



Wreckage of camoflauged wartime civil Nakajima AT-2 Transport captured at Singapore. Absence of registration on aircraft is typical of civil types in the last few months of the war. Only civil stripes at the rear of the fuselage and the Japan Air Transport aircraft name *Teiten* ("Calm Sky") on nose permits civil identification. White outlined *Hinomaru* is on fuselage, other markings on fin and rudder.

Post-war civil markings on prototype Kawasaki KAT-1 appear as a four-digit code following the national letters "JA." Registration JA3084 is painted vertically on rudder. Factory insignia appears on fuselage.



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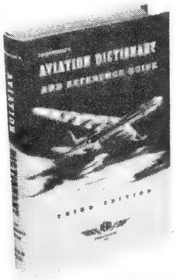

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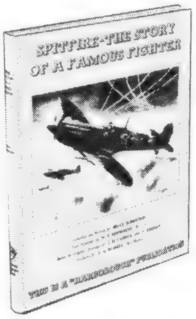
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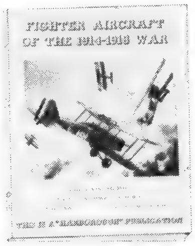
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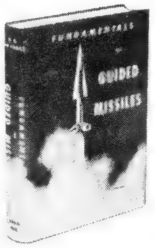

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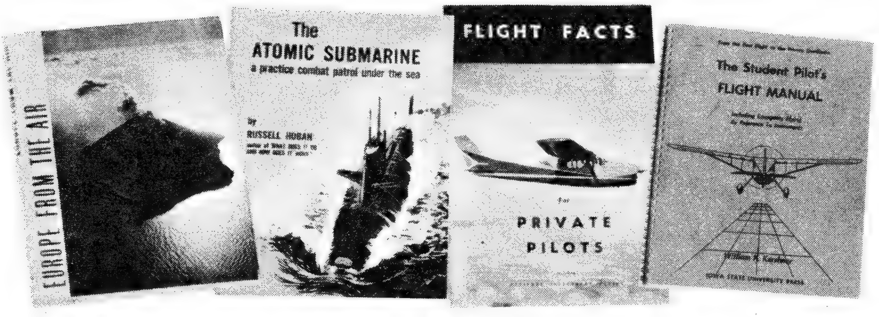

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Europe From The Air by Emil Egli and Hans Richard Muller (editor), with an introduction by Salvador de Madariaga, translated from the German by E. Osers (Wilfred Funk, Inc., 153 E. 24th St., New York 10, N. Y.), 9" x 11", 222 pgs, 184 large photographs of which 11 are in natural color, hard cover, $15. This striking book contains some of the most remarkable photographs of European scenery ever presented in one volume. Air pix unfold a panorama of almost every type of landscape on the Continent and in the British Isles: mountains and cities, forests and rivers, agricultural and industrial areas, famous cathedrals, ancient monuments, airports, seaports, docks, roads, and railways. A great gift to any USAF'er who was in Europe during World War Two.

Flight Facts For Private Pilots by Merrill E. Tower (Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif.), 7-1/2" x 10-3/4", 216 pgs, 250 drawings and photographs, soft cover in color, $3.50; hard cover, $5. Modern ground school text is logical companion to Aero Publishers' *Civil Air Regulations & Flight Standards For Pilots.* Educational reading for any aviation enthusiast and an excellent review for all pilots; published particularly for student and private pilots.

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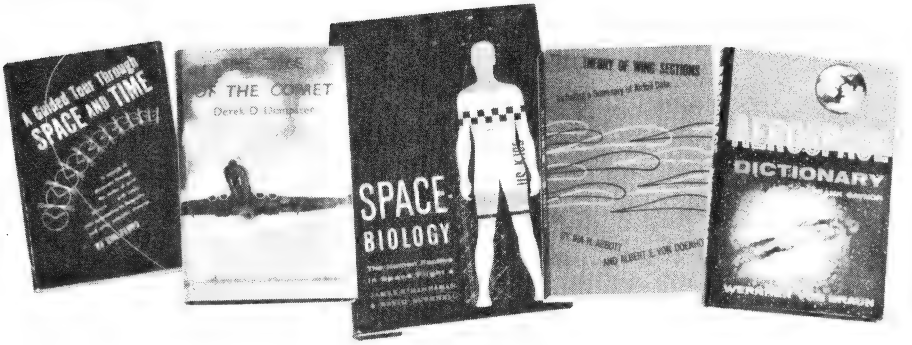

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Black Thursday by Martin Caidin, drawings by Fred L. Wolff, numerous official photos and maps (E. P. Dutton & Co., Inc., 300 Fourth Ave., New York 10, N. Y.), 5-1/2" x 8-1/4", 320 pgs, hard cover, $4.95. October 14, 1943, Black Thursday, the day 291 U. S. heavy bombers and their escort of 103 P-47 Thunderbolt fighters flew across German-dominated Europe to attack and destroy the heavily-defended German ball-bearings center at Schweinfurt. In a series of suspenseful, hard-hitting scenes, Caidin has reconstructed the grueling hours of Mission 115.

Civil Air Regulations and Reference For Mechanics by the associated aeronautical staff of Aero Publishers, Inc. (2162 Sunset Blvd., Los Angeles 26, Calif.), 7-1/2" x 10-3/4", 152 pgs, hard cover, $4.50; paper cover, $2.95. For aviation mechs and students this revised 15th edition contains all the Federal Aviation Agency regulations applicable to those working on either the structural part (airframe) or the engine (powerplant) of an aircraft. With check questions.

The Atomic Submarine—A Practice Combat Patrol Under the Sea by Russell Hoban (Harper & Brothers, 49 E. 33rd St., New York 16, N. Y.), 9" x 12", 32 pgs, hard cover, $2.50. Word and picture report to delight small boys by well-known illustrator of children's books. Here are submariners at work; this glimpse of their perfect unity will fascinate both young and old.

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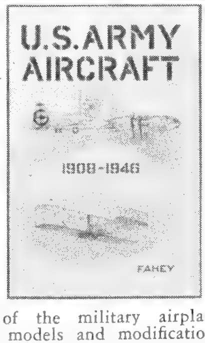

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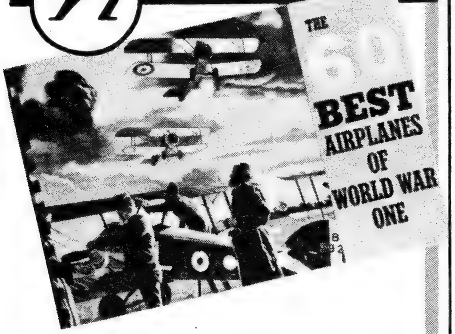

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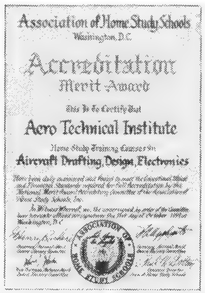

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The Tale of the Comet by Derek D. Dempster (David McKay Co., Inc., 119 W. 40th St., New York 18, N. Y.), 5¼″ x 8½″, 218 pgs, with photographs, hard cover, $4. The story of this deHavilland jet transport and the frightful accidents that wiped it temporarily from the sky is one of the most remarkable and dramatic in the history of flight. Here is the full story of the design, the construction, the initial triumphs and the sudden striking of disaster—two planes inexplicably disintegrating in mid-air. Thus began one of the greatest engineering detective stories of all time in determining the cause of the disasters.

The Aeroplane—An Historical Survey of Its Origins and Development by Charles H. Gibbs-Smith (Her Majesty's Stationery Office, York House, Kings-

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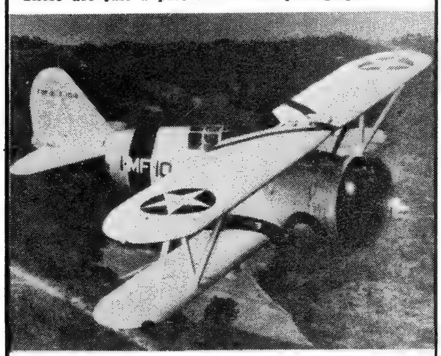

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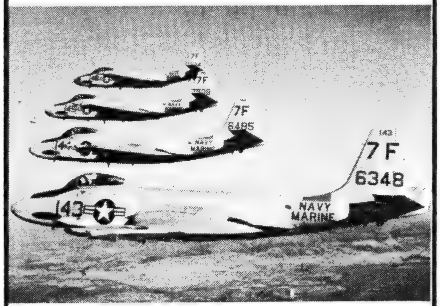

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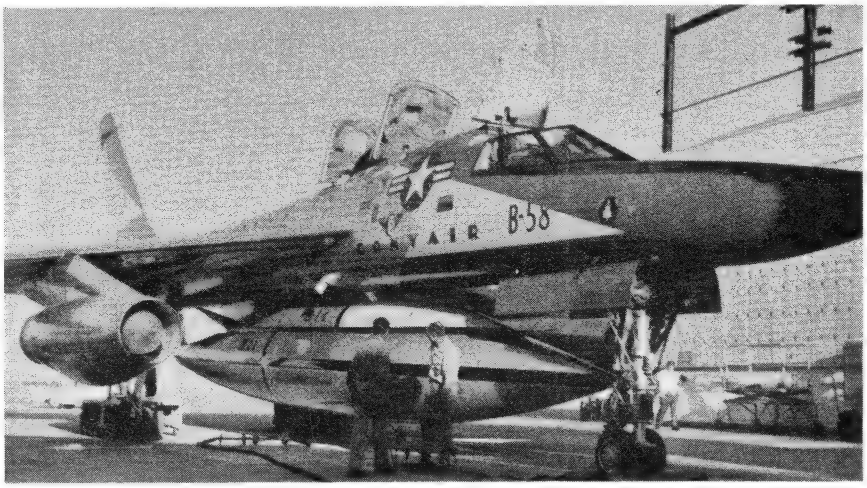
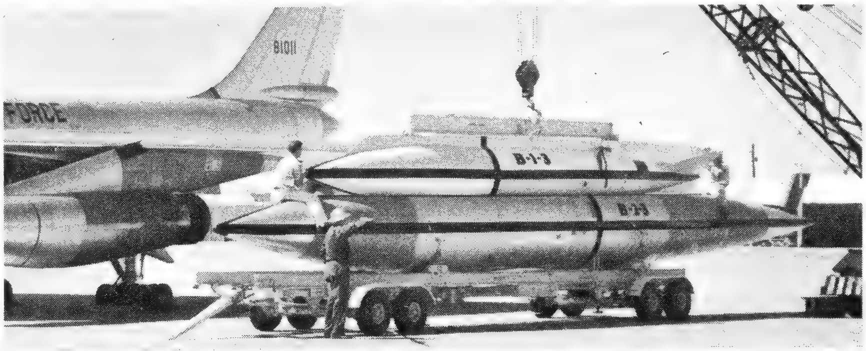
way, London W.C. 2, England), 6" x 9½", 375 pgs, 140 photos, 40 line drawings, hard cover, 1 Pound & 15 shillings. The first general survey of the development of the airplane that has appeared in recent years, the first in such detail from the birth of the airplane to the practical flying machine. The book is divided into two main parts; a narrative Historical Survey, and a Commentary, separated by an Interlude of memorable quotations on flight and flyers. With detailed index and numerous Rolfe drawings from previous issues of *Air Progress.* A masterpiece.

Aerospace Dictionary by Frank Gaynor with introduction by Wernher von Braun (Philosophical Library, 15 E. 40th St., New York 16, N. Y.), 6" x 9", 260 pgs, hard cover, $6. Reference work of essential terminology in space exploration prepared with assistance of U. S. Department of Defense. Includes every abbreviation in use, together with designations of missiles and vehicles.

The Student Pilot's Flight Manual by William K. Kershner (Iowa State University Press, Ames, Iowa), 8½" x 11", 140 pgs, 230 illustrations, spiral bound, paper cover, $2.95. Informative handbook leads the student step-by-step through all the procedures for securing a private ticket—including the new instrument training required by FAA. We liked the advice for making a forced landing . . . "pick the softest, cheapest thing in the vicinity, and hit it as slowly as possible."



TWO-PART POD: Convair crew inspects new 2-part droppable pod on USAF B-58 Hustler bomber. Two-component pod adds speed and range to Mach 2 craft. Fuel-carrying lower portion can be dropped when its supply is exhausted. In actual combat the B-58 would fly on to its target only with the upper pod, which carries a nuclear bomb. Below, the weapon-carrying upper pod is fitted into place atop the fuel-carrying lower unit, ready for attachment to bomber. Convair, makers of Hustler, is a division of General Dynamics Corp.



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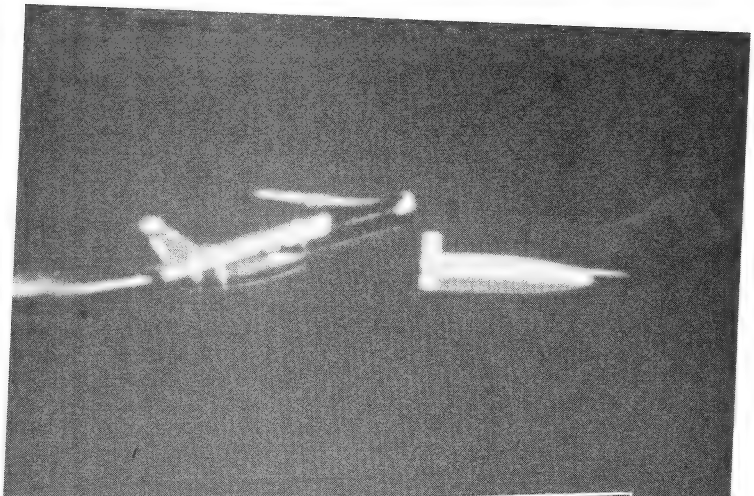

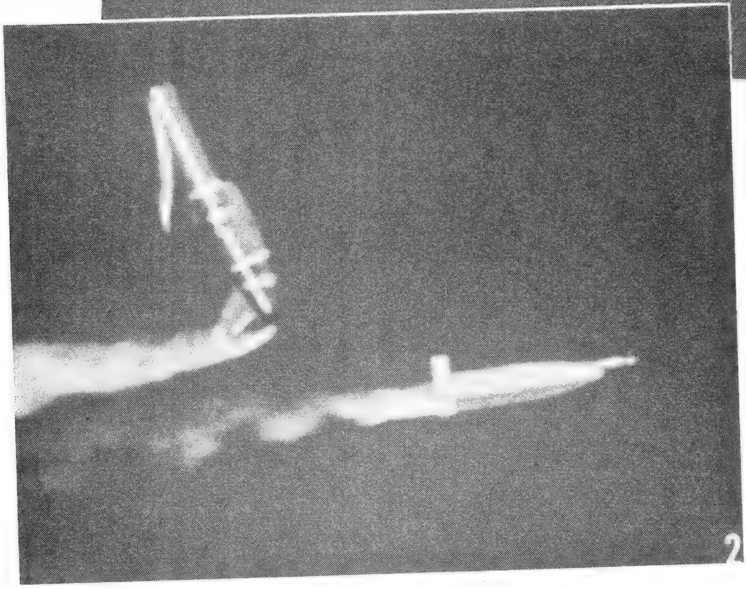

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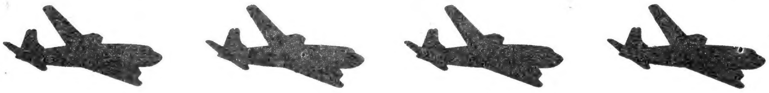

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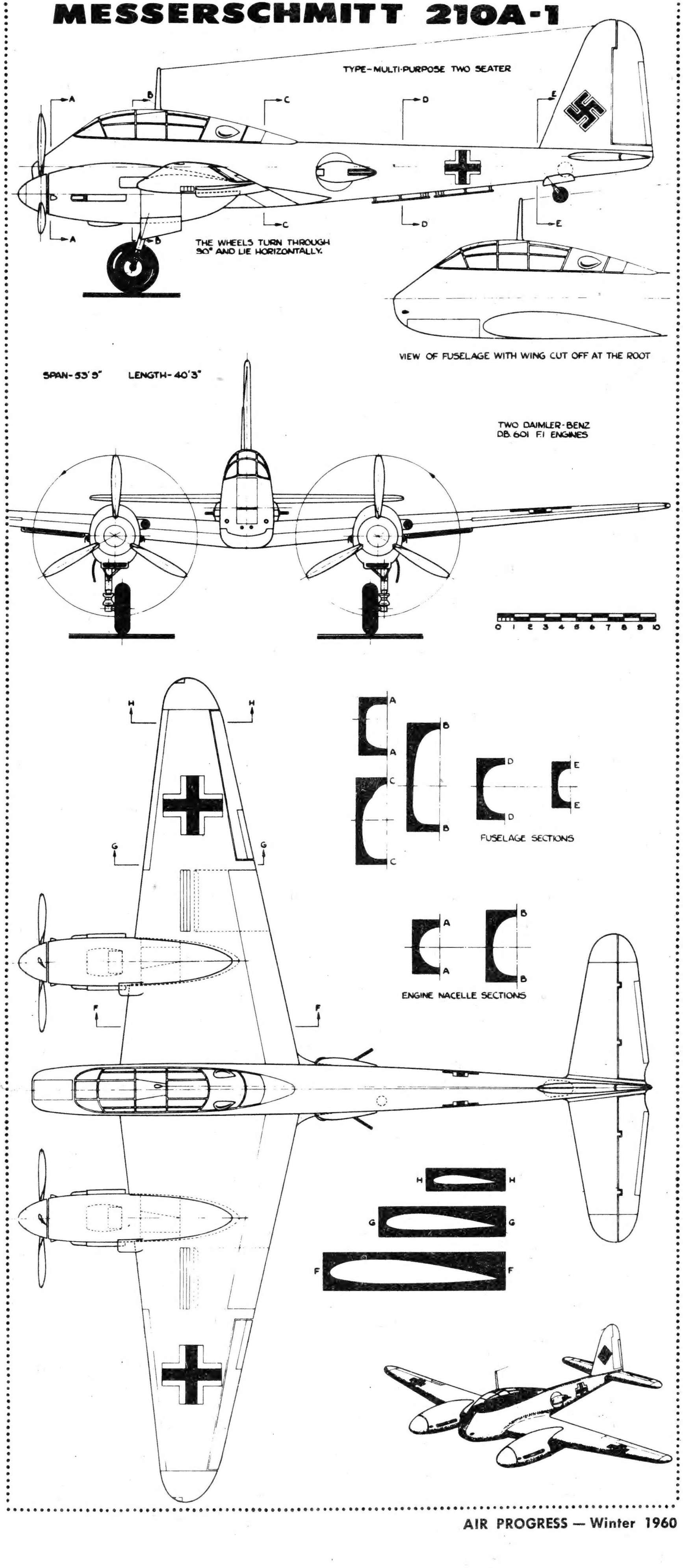
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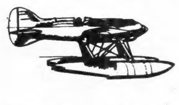
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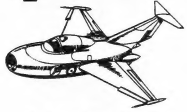
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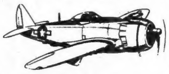
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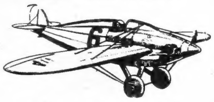
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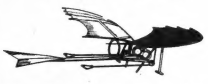
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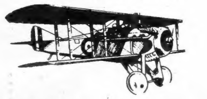
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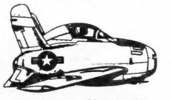
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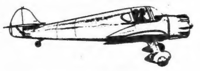
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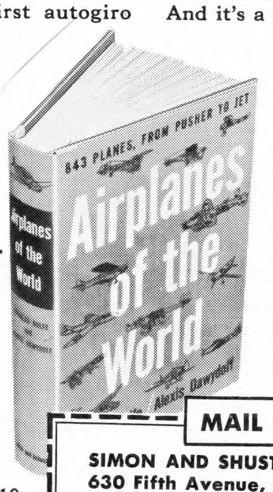

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